DOCUMENT RESUME

ED 045 208 PS 004 062

AUTHOR	Falkner, Frank, Ed.
TITLE	Key Issues in Infant Mortality.
INSTITUTION	National Inst. of Child Health and Human Development (NIH), Bethesda, Md.
PUB DATE	16 Apr 69
NOTE	92p.: Report of a Conference, April 16-18, 1969, Washington, D.C.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 ($1.00)
EDRS PRICE	EDRS Price MF-$0.50 HC Not Available from EDRS.
DESCRIPTORS	Comprehensive Programs, *Death, *Environmental Influences, Family Planning, Health Services, *Infants, Physiology, *Pregnancy, Prenatal Influences, *Research Needs, Social Problems, Socioeconomic Influences

ABSTRACT

This pamphlet summarizes the proceedings of a conference on infant mortality sponsored by the National Institute of Child Health and Human Development. Participants were 25 people engaged in various disciplines (physicians, nurses, social workers, sociologists, statisticians and others) who discussed key issues on the basis of their own knowledge and experience. The two major points made were: (1) that society needs to concentrate less on the reduction of infant mortality as a goal in itself than on assuring that children who survive are whole, healthy individuals, and (2) that no matter how good the medical care system is, mortality rates cannot be lowered below a certain point unless certain changes are made in the social environment. Within this context, many issues and areas in need of research were identified, particularly in connection with the period when the majority of deaths occur: the last eight weeks before birth and the first four weeks after birth. It was also emphasized that there is already sufficient knowledge to significantly lower the infant mortality rate in the United States if institutional change, including comprehensive care programs for the poor, could be effected. (Author/NH)

ED0 45208

U. S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

KEY ISSUES
IN INFANT MORTALITY

Report of a Conference
April 16-18, 1969
Washington, D. C.

Frank Falkner, M.D., M.R.C.P.

Scientific Editor

National Institute of Child Health and Human Development
Bethesda, Maryland

PS 004062

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $1

FOREWORD

Last year the National Institute of Child Health and Human Development called together a number of consultants to identify the key issues in infant mortality. What the participants gave us was an analysis that reached beyond the surface things they might have said to lay bare the underlying web of contributing factors. As each participant gave the Institute the benefits of his own experience in relation to infant mortality, this fabric of interrelating problems and solutions was brought to view in a way that will be most helpful to the Institute in determining the directions its own further efforts should take.

This summary of the conference proceedings lays the foundation of what is now known about the causes of infant mortality. It also points the way to preventive measures and to areas of research which need more study. It is anticipated therefore, that it will serve as a guide and a stimulus to those investigators interested in solving the problems of infant death.

Frank Falkner, M.D., M.R.C.P.
Associate Director
for Planning and Evaluation
National Institute of Child
Health and Human Development

CONTENTS

FOREWORD.. i

LIST OF PARTICIPANTS...................................... iii

KEY ISSUES IN INFANT MORTALITY............................ 1

EPIDEMIOLOGICAL AND BIOMETRIC ISSUES IN INFANT MORTALITY.................................... 9

NATIONAL EXPERIENCES WITH INFANT MORTALITY................ 16

- Infant Mortality: the International Spectrum........ 16
- Infant Mortality in the United States............... 17
- Infant Mortality in Sweden........................... 19
- Infant Mortality and Pediatric Progress in Ghana..... 22

SOCIOECONOMIC FACTORS IN INFANT MORTALITY................. 25

- Infant Mortality: A Measure of Social Policy........ 25
- The Legal Rights of the Fetus....................... 28
- Family Planning in Relation to Infant Mortality...... 30
- Reducing Infant Mortality Through Comprehensive Maternity and Infant Care......................... 34
- Developing a New Mixture of Services................ 39
- Establishing Priorities. 41

HEALTH CARE FACTORS IN INFANT MORTALITY................... 46

- Fetal Excellence: the New Goal of Obstetrics........ 46
- Prenatal and Postnatal Diagnosis and Treatment....... 49
- Neonatal Research and Care.......................... 51
- Nursing Care of the Newborn......................... 56
- Health Manpower..................................... 60
- Assuring Intact Survival............................ 64

NEW INSIGHTS AND NEW DIRECTIONS........................... 67

FIGURES AND TABLE 68

INDEX... 73

ADVISORY CONFERENCE ON KEY ISSUES IN REDUCING INFANT MORTALITY

April 16-17-18, 1969

CHAIRMAN

Frank Falkner, M.D., M.R.C.P.

PARTICIPANTS

Karlis Adamsons, M. D. Ph.D.
Professor of Obstetrics
and Gynecology
College of Physicians and Surgeons
of Columbia University
New York, New York

Nancy Amidei
Staff Assistant
Senate Select Committee
on Nutrition and Human Needs
Washington, D. C.

Billy F. Andrews, M.D.
Associate Professor
Director, Newborn Services
Department of Pediatrics
University of Louisville School of Medicine
Louisville, Kentucky

John R. Ashford, Professor
Department of Mathematics
University of Exeter
Exeter, Devon, England

Walter M. Beattie, Jr., Dean
School of Social Work
Syracuse University
Syracuse, New York

Philip L. Calcagno, M. D.
Professor and Chairman
Department of Pediatrics
Georgetown University School of Medicine
Washington, D.C.

Arthur Campbell
Deputy Director
Center for Population Research
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Philip Corfman, M.D.
Director
Center for Population Research
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Frank Falkner, M.D., M.R.C.P.
Associate Director for Program
  Planning and Evaluation
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Jonathan Fielding
Senior Medical Student
Harvard Medical School
Boston, Massachusetts

Lillian Freedman
Chief, Program Statistics Branch
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Charles P. Gershenson, Ph.D.
Director, Division of Research
Children's Bureau
Department of Health, Education, and Welfare
Washington, D.C.

Louis Gluck, M. D.
Professor of Pediatrics, School of Medicine
University of California, San Diego
La Jolla, California 92037

Samuel Greenhouse, Ph.D.
Chief, Epidemiology and Biometry Branch
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Eileen G. Hasselmeyer, Ph.D., R.N.
Annie W. Goodrich Visiting Professor
Yale University School of Nursing
New Haven, Connecticut

Gavin Hildick-Smith, M.D., F.A.A.P.
Director of Clinical Research
Johnson and Johnson
New Brunswick, New Jersey

Jehu Hunter
Assistant to the Chief, Perinatal
  Biology and Infant Mortality Branch
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Hugh Jolly, M.D., F.R.C.P., Physician i/c
Department of Paediatrics
Charing Cross Hospitals
London, England
Visiting Professor of Child Health
Ghand Medical School

Petter Karlberg, M.D.
Professor and Chairman
Department of Pediatrics
University of Göteborg
Children's Hospital
413 46 Göteborg, Sweden

Sanford N. Katz
Professor of Law
Boston College Law School
Brighton, Massachusetts

Sarah H. Knutti, M.D.
Assistant Director
(Clinical Programs, Facilities and Resources)
Office of Program Planning and Evaluation
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Arthur J. Lesser, M.D.
Deputy Chief
Children's Bureau
Department of Health, Education, and Welfare
Washington, D.C.

Charles U. Lowe, M.D.
Scientific Director
National Institute of Child Health
  and Human Development
Bethesda, Maryland

Adam P. Matheny, Jr., Ph.D.
Assistant Professor of Pediatrics
University of Louisville
School of Medicine
Louisville, Kentucky

Iwao M. Moriyama, Ph.D.
Director
Office of Health Statistics Analysis
National Center for Health Statistics
Department of Health, Education, and Welfare
Washington, D.C.

Paul H. Pearson, M.D.
Director, Children's Rehabilitation Institute
C.L. Meyer Professor of Child Health
The University of Nebraska
College of Medicine
Omaha, Nebraska

Franz Rosa, M.D.
Chief Medical Officer
Maternal and Child Health
World Health Organization
1211 Geneva, Switzerland

Jerry Seligman, M.D.
Department of Pediatrics
University of Louisville
School of Medicine
Louisville, Kentucky

Carl S. Shultz, M.D.
Director, Office of Population
and Family Planning
Office of the Assistant Secretary
for Health and Scientific Affairs
Department of Health, Education, and Welfare
Washington, D.C.

Donald C. Smith, M.D.
Chairman and Professor
of Maternal and Child Health
School of Public Health
University of Michigan
Ann Arbor, Michigan

Conference Staff

Miss Betty Barton
Chief
Scientific Conference Branch

Mrs. Anne Berk
Secretary
Scientific Conference Branch

Miss Karen Phelps
Secretary
Office of Planning and Evaluation

Mrs. Leora Wood Wells
Contract Science Writer

KEY ISSUES IN INFANT MORTALITY

By its very definition infant mortality is a grim and distasteful topic. It is perhaps because we find it difficult to face the idea of children dying that we so often take refuge in statistics. It is easier to talk of deaths per 1,000 live births than it is to think of an individual child whose life is snuffed out almost before it has begun.

But the mars on maps of the United States, showing infant deaths clustered ominously in our major urban areas and in poverty-ridden sections of the deep South and West make it clear that we must stop playing the numbers game and get at causes and possible solutions.

It was for this reason that the National Institute of Child Health and Human Development asked a group of physicians, nurses, medical students, social workers, sociologists, statisticians and others concerned with problems of community health and welfare to meet together in April 1969, to identify and discuss Key Issues in Infant Mortality. The Institute's responsibilities center around studies contributing to normal human development. Because there is nothing normal about infant mortality, the Institute has a particular responsibility to explore what can be done to weed out this problem and to encourage the healthy survival of children. Research is needed, both in relation to the causes and prevention of infant mortality and in relation to the kinds of services that are needed to bring the problem under control.

The group that met with members of the NICHD staff under the chairmanship of Dr. Frank Falkner was relatively small--about 25 people of various disciplines who work in a variety of settings. There were no formal presentations. The participants spoke from the basis of their own specialized knowledge and experience, and discussion was free-ranging and animated. By the time the conference ended, a number of key issues had not only been identified but explored in considerable depth and numerous suggestions for action and research had been made.

Welcoming the conference group on behalf of Dr. Gerald LaVeck, Director of the National Institute of Child Health and Human Development, Associate Director for Intramural Research Programs, Dr. Charles Lowe, said that the programs of the Institute have three major thrusts: extramural research, intramural research, and the development of public policy. In this third capacity, the Institute prepares position papers for appropriate segments of Government and provides advice to the American and international professional public. The Institute develops ideas, Dr. Lowe said. Then it programs the ideas so that they may lead to action for the benefit of those segments of society for which the Institute carries certain responsibilities.

This conference, Dr. Lowe said, fits within the scope of this third function. In this country and many countries of the world we have an astonishingly and in many ways shamefully high infant mortality rate, and we have no true concept of what the lowest possible rate might be. In the United States the rate is nearly double that of Sweden, and we do not know why. This rate exists within a prodigiously rich country with a wealth of medical, physical and professional resources; and one wonders why the concentration of these resources cannot be brought to bear upon the problem.

But before they can be, the issues and potential solutions must be examined. It is our hope, Dr. Lowe concluded, that out of meetings such as this one, the thrust and focus of Institute research may be so formulated that it will lead to the evolution of public policy which will, in turn, lead to significant decreases in infant mortality in this and other countries.

The two points that were underscored most heavily by the conference participants were:

1) that we need to concentrate less on the reduction of infant mortality as a goal in itself than on assuring that children who survive are whole, healthy individuals, and

2) that it is fallacious to argue about whether the quality of medical care or the child's environment is the more important factor in relation to infant mortality. These cannot really be separated. No matter how good the medical care system is, mortality rates cannot be lowered below a certain point unless certain changes are made in the social environment.

Within this context, the participants identified the following key issues and areas in need of research:

What is the irreducible minimum point for the infant mortality rate?

> Many infant deaths after the first week of life are the result of such problems as congenital anomalies and chromosomal aberrations, and there is probably little that can be done to reduce mortality among these infants. However, many deaths after the first week are due to preventable problems, and considerable reductions should be possible. For example, about 40 percent of those who die after the first week but during the first year of life die of infections, and it should be possible to reduce this incidence. The principal reduction, however, must be among infants who die during the first week of life. The rate for this period is extremely high. We have no true concept of what the lowest possible rate may be. However, we do know that an infant mortality rate as low as 12.6

per 1,000 has already been achieved by one country and that further reductions appear probable.

Why do so many infants die during the first week of life?

In 1968, approximately 75,000 infants in the United States died during the first year of life. Of these an estimated 50,000 died within the first week. This means that all but eight infant deaths per 1,000 live births occurred during the first week of life--a rate of 14 per 1,000 for that crucial week out of a total of 22 per thousand for the entire period of infancy. About three-fourths of these children are born at weights of 2500 grams or less. Prematurity and low weight births have increased about 12 percent. It is obvious that low birth weight and short periods of gestation are key factors in infant mortality.

Why do these children leave their uterine environment at these low birth weights?

To answer this question we must look not only at the quality and availability of health care services but at the biological, social and economic environment in which the child is conceived and carried. Our greatest efforts must focus on the factors in this environment which affect his ability to survive his first week of life. We need to know more about the importance of pregnancy intervals, the age of the mother, parity, the exact role of maternal nutrition, and the factors responsible for the onset of labor.

What can be done by families with their present resources to reduce infant mortality, particularly in the post-neonatal period?

Breast feeding is one of the most effective ways of overcoming factors related to lack of resources, such as infection and poor nutrition. Since these factors are of such importance, a significant increase in the practice of breast feeding would surely lead to a reduction in infant mortality. Furthermore, nursing at the breast provides the sensory input to both mother and baby leading to increased socialization and well-being.

Why do the disadvantaged have higher infant mortality rates and a higher proportion of low birthweight babies?

Because of environmental factors, children in the lower social classes are often born with inferior resistance to infection. With the same quality of medical care other babies receive, they may still have a high mortality rate. We need to work preventively by improving the health of girls and young women many years before they become pregnant.

There is tremendous variance among different subgroups of the population, but it is an oversimplification to tie the problem too closely to race. Negroes are a visible minority in this country, so we tend to single them out; but from a numerical standpoint there are twice as many disadvantaged whites as there are blacks, and they also have high incidences of these problems. The rates of low weight births and infant mortality are different even in different parts of the same city. We need to zero in on what we must change for each population subgroup in the system of care or the total social and economic environment.

What can we do to relieve social and economic disadvantages which work against the well-being of mother and child?

We have major problems of poverty, nutrition, sanitation, home conditions in this country which impinge adversely on infant mortality. We have adverse social conditions like illegitimacy, too many and too frequent pregnancies in women at high risk for a combination of reasons. We may or may not be able to manipulate these adverse social conditions in ways that will reduce low weight births, morbidity, and mortality.

Where can we intervene to change the predicted course of events?

Intervention can occur at many points over a long time span: during the childhood of the mother, prior to pregnancy, during pregnancy, during delivery, the neonatal period and the first critical months and years of development. We know a great deal about what happens to babies at these various stages, and recognize them as factors in the child's development, but we seem to know astonishingly little about why these factors operate or why they cause what they do. For many babies there is a "critical incident"--a brief space of time after birth which can make the difference between life and death, or between intact survival and survival with handicapping conditions. But the crucial need is to prevent these "critical incidents" from occurring by assuring fetal excellence. One recent study of infants who died within the first few days of life showed clearcut evidence that 70 percent of them had been sick in utero for more than a week prior to birth. This underscores the need to give attention not only to secondary prevention--that is, prevention of brain damage and other problems by intensive care at birth--but also to primary prevention through prenatal intervention.

How can we evaluate the effectiveness of various types of intervention?

It has already been demonstrated that comprehensive maternity and infant care and intensive neonatal care can make dramatic changes in the mortality rate, but they are not the whole answer. Better care of the fetus may yield even greater returns than intensive neonatal care, particularly in terms of intact survival.

In order to evaluate various forms of intervention, we need longitudinal studies that bridge from one generation to another. The Maternity and Infant Care Program of the Children's Bureau* provides a logical starting point for such studies. Information on birth and the first year of life is already available for a large cohort. This could easily be extended into a longitudinal study.

What do we know now that will permit us to establish priorities in relation to intervention?

Even in a wealthy country, there is a limit to resources. We have to separate our goals into two areas: changing the social structure and the underlying socioeconomic problems, and taking a simple, practical approach to bring about an immediate decrease in neonatal and infant deaths and an increase in intact survival. We have the ability to bring about immediate reductions of 40 to 60 percent in infant mortality in parts of the country where it is high if we make use of the knowledge we now have.

This can be done in a number of ways. Child health services throughout the country can and should be expanded rapidly through the maternal and child health programs. Many, but not all, of the participants felt that the Department of Health, Education, and Welfare should also give high priority to the support and development of more regional intensive neonatal care centers and regional education programs.

*Public law 88-156, October 24, 1963, amended January 2, 1968. This program is now administered by the Maternal and Child Health Service of the Health Services and Mental Health Administration, DHEW.

What are the responsibilities of various members of the health care team in relation to infant mortality?

> Health care services in this country are in a state of transition, and we do not yet have an effective system. We need a new mix of comprehensive services which draw upon the skills of many professional and paraprofessional disciplines. The roles of the various disciplines have changed as the emphasis has shifted from a focus on saving the mother to saving the infant, and now to assuring the intact survival of the child. Obstetricians, pediatricians and nurses all need to become more deeply aware of community health needs and more deeply involved in their solution. This they can do only through better distribution and use of scarce professional manpower.

What are the unmet training needs in relation to infant mortality?

> We need not only to train more health manpower, and more types of manpower, but we need to train members of the health team in totally new ways. Hospital-oriented training is often too remote from the problems of community health to provide the practical understanding students will need when they go into practice.

Can progress in the reduction of infant mortality be extended to cover all of the problem populations in the United States, and if so, how rapidly?

> This is a difficult assignment. One possibility that needs to be explored is how Medicaid can be expanded to provide better coverage for children. We also need to improve planning and organization of health care services, and to increase cost effectiveness through better use of personnel and other resources.

Does consumer participation in planning health care services have an effect on infant mortality?

> Consumer participation can help to assure that the services that are developed are the kind that people need, want, and will use. However, direct responsibility for reducing infant mortality must rest primarily with the medical profession and other disciplines concerned with the health and welfare of children.

What is the impact of family planning on infant mortality?

Family planning has an indirect rather than a direct effect on infant mortality, because it makes better spacing possible and may reduce pregnancies among very young woemn, those beyond the peak child-bearing years, those who are ill, and those who will be poor mothers or abusive mothers because they do not want children. However, we need more definitive information about the exact effects of spacing on infant mortality.

We are still uncertain about the interaction between chemical birth control and infant mortality and morbidity. Intensive study of the effects on reproductive behavior should be done before the use of oral contraceptives becomes more widespread. We need also to consider whether the age of women taking such contraceptives is an important factor.

What are the effects of abortion and abortion laws on infant mortality?

We have as yet scarcely begun to consider the possible relationship between restrictive abortion laws that force women to bear children they don't want, the 8,000 children who appear in hospitals each year because they have been abused by their parents, and the 350 who are murdered each year by their parents. The question of abortion law is a complex one, for it involves not only the rights of adults to choose whether a woman shall bear a child once it is conceived, but also the rights of the fetus to life and the rights of children to be born into environments which will contribute to their healthy development.

The physical consequences of abortion in relation to infant morbidity and mortality are not adequately understood at the present time. Experience in countries where abortions are readily available suggests that some forms of abortion may increase the risks of prematurity and low weight births among babies of mothers who have previously had one or more abortions.

How meaningful are the data now available on perinatal and infant mortality?

Investigators are handicapped by the number of variables that need to be controlled and the lack of uniform definitions and reporting procedures. However, the data are suggestive and point to some of the major problems.

What can we learn from the infant mortality experiences of other countries?

A great deal, as long as we resist the temptation to overgeneralize. What works well in one country may or may not be a good solution in another country. No one system of care can be devised which is best in all settings. Infant mortality and morbidity are complex problems involving many factors, some of which prevail universally and some of which are unique to particular geographical and social settings. We need to study all possible approaches and make use of those applicable to problems in various areas of our own country.

What are the greatest research needs in relation to infant mortality?

Epidemiological studies to identify preventable factors in infant deaths are greatly needed; for example, in relation to sudden unexplained crib deaths, which are responsible for 10% of our infant mortality. Many of the reductions in infant mortality in recent years are directly attributable to what research has taught us about such problems as hyaline membrane disease, asphyxiation, and the effects of Rh antibodies. Factors determining the duration of gestation and the role of the fetus in the initiation of labor need to be explored. In addition, controlled evaluation studies are needed to determine the effectiveness of various types of medical intervention. Nearly every key issue discussed by the conference participants contains elements which need further research.

Are infant mortality rates valid indicators of social effectiveness?

Probably not. With our present level of knowledge and the provision of intensive neonatal care we are able to salvage the lives even of very small infants from virtually any social and economic background. The question of physical and mental deficit remains to be resolved. If we save the life of a 1,000 gram baby, can we predict that he will be able to live an effective life as he matures? Only when we are able to assure that each surviving child will be able to achieve optimal development will we be able to equate reductions in infant mortality with social effectiveness.

What can we do to assure every baby a chance to be wellborn?

The critical issue is no longer whether we can salvage another 35,000 live infants each year. We do not want simply survivorship with lifelong handicaps. We need to direct the greatest force of our research and our program efforts toward the factors that encourage the intact survival of wellborn infants.

These, in brief, are the key issues delineated by the conference participants. In the sections of the report which follow, the discussions that led to identification of these points are given in greater detail. They fall under several broad headings: epidemiological and biometric issues, national experiences, socioeconomic factors, health care factors, and family planning. But each discussion covered a great range. Some of the participants presented factual reports on programs now in operation; others spoke in more philosophical terms of the underlying problems. The cumulative effect was an impressive amount of illumination cast on a difficult problem.

EPIDEMIOLOGICAL AND BIOMETRIC ISSUES IN INFANT MORTALITY

It is now well established that infant mortality may result from a wide variety of influences. These include purely physiological factors, the availability and quality of medical care for mother and child and a wide range of social and economic attributes covering not only the period of the pregnancy but also possibly the environment of the mother during her own childhood. Efforts to apply statistical methods to data relating to infant mortality are greatly complicated by the number of factors involved, by the close association among many of these factors and by the complexity of the underlying biological studies. The practical difficulty of controlling so many variables makes the relative importance of the various contributory agents very difficult to assess.

Professor John Ashford of the University of Exeter in England first became interested in the biometric and epidemiological issues in infant mortality some five years ago, he said, through the work of a friend, Dr. Frederic S. W. Brimblecombe, M.D., F.R.C.P., Consultant Paediatrician. Professor Ashford is a mathematician and is Director of the University's new Institute of Biometrics. Although recognizing the interrelationship of many factors, Professor Ashford said that the two key influences in perinatal mortality are birth after too short a period of gestation and low birthweight. In terms of survival, a gestational age of 38 to 41 weeks at birth appears to be the most favorable. In general, birth weight increases as the gestational age increases up to about 40 weeks, but post-mature babies do not, on an average, weigh more than infants born at normal term.

Although it would be desirable to base an epidemiological analysis on a combination of data about gestational age and birthweight, it must be recognized that reliable information about gestation is notoriously difficult to obtain, particularly when dealing with a large population of births. For this reason the studies currently in progress in Exeter are concerned mainly with birthweight, which is, both closely related to gestation and very important in its own right. Studies carried out in the United States and elsewhere have shown that when both birthweight and gestational measures are available the former accounts for a considerably greater part of the observed variations in perinatal mortality than the latter.

Professor Ashford presented a number of slides to illustrate his data. Figure I* shows the relation between perinatal mortality (late fetal deaths and deaths within the first week of life) and birthweight in the population of some 8,000 live and still births taking place in the County of Devon during 1965. In this graph the perinatal mortality rates have been plotted on a non-uniform "probit" scale, of the type which is commonly used in the assessment of data arising from biological assays. It will be noted that the relation falls into two distinct parts. For birthweights of below 2,750 grams, perinatal mortality falls linearly with increase in birthweight. The rate is about 800 per 1,000 for births of about 1,000 grams, and falls to about 10 per 1,000 for births of up to 2,500 grams. The rate for infants weighing more than 3,000 grams is effectively constant, apart from a slight upswing in the very heavy weight groups. The same general pattern has been observed in studies from a wide variety of subjects in the United States and elsewhere in the world. There is no doubt that the variation of perinatal mortality in terms of birthweight, which covers a range of almost 100 - 1, is considerably greater than that associated with any other single factor, sociological, environmental or biological.

The main consequence of this type of relationship is that the overall perinatal mortality in a population depends very critically upon the proportion of low weight births. In the Exeter population, the 7% of births at weights of less than 2,500 grams account for as much as 60% of the total perinatal mortality. When different populations are compared, the perinatal mortality in the less-than-2,500 grams weight groups of one population is greater than that in the other; but the reverse applies in the above-2,500 gram weight groups. The data for county boroughs and other local authorities in England and Wales during the period 1956 - 65, as shown in Table I,** illustrate this point. This underlies the fact that in comparative studies, consideration of overall perinatal mortality alone may well conceal vital differential differences in terms of birthweight. A similar pattern is obtained when other measures of mortality are studied, such as the proportion of late fetal deaths, the proportion of late fetal deaths plus deaths within the first day of life, and the proportion of late fetal deaths plus deaths within the first 28 days of life.

Analyses of data covering both gestational age and birthweight in terms of perinatal mortality also show some interesting effects, Professor Ashford said. Figure II+ shows the results reported by Bonham and Butler in their 1958 perinatal study in the United Kingdom. For fixed gestational period, the perinatal mortality-birthweight relationship is of a similar form to that observed when all gestational ages are taken together. However, for a given birthweight, perinatal mortality decreases with gestational age between 32 and 40 weeks, reaches a minimum at 40 weeks, and then increases again with increasing gestational age up to 44 weeks.

---

* page 68

** page 69

+ page 70

In view of the importance of birthweight, the distribution of this factor within a population is of considerable interest. Figure III* shows a histogram representing the weights of all late fetal deaths and live births occurring in Devon County during 1965. This shows the usual bell-shaped normal or Gaussian form, apart from a disturbance at the lower end of the birthweight range. In order to examine this latter point more closely, it is helpful to plot the cumulative distribution of birthweights (i.e. the proportion of births of less than a given weight), on a probit scale as illustrated in Figure IV.** When this type of plot is used, a single Gaussian distribution appears as a straight line. In this event we find that there are, effectively, two straight lines which correspond to a mixture of two separate Gaussian distributions. Similar forms of birthweight distribution have been observed for the data from many natural populations of births from all parts of the world, and it seems clear that this mixture of Gaussian distributions is a general phenomenon.

Mathematical techniques have been developed at Exeter to assess the mean and standard deviation of the two separate distributions and the proportions of each in the population, Professor Ashford said. It has been found that, in general, 90 - 95% of the population belongs to what has been termed the "primary" distribution of birthweights which has a mean of about 3,500 grams and a standard deviation of about 500 grams. The remaining 5 - 10% of the population belongs to the "secondary" distribution with a mean of about 2,000 grams and a standard deviation of about 800 grams. The biological significance of this observation is by no means clear, although the workers at Exeter have interpreted the primary distribution as representing the births which follow a "natural" course without any complication of fetal development. However, since a high proportion of the low weight births belong to the secondary distribution, it follows that the proportion of births from this distribution is a very important factor in determining the overall perinatal mortality in a population.

Professor Ashford discussed temporal changes in perinatal mortality in England and Wales, in terms of the birthweight model. Throughout the whole period from 1956 through 1965, the perinatal mortality was somewhat higher in urban rather than in rural areas. In the urban areas the rate dropped from about 40 to about 30 per 1,000 during the 10 year period, whereas in the rural areas the fall was from about 38 to about 27 per 1,000. However, an interesting contrast appears when the perinatal mortality figures are sub-divided by birth weight. Throughout the period the perinatal mortality in less-than-2,500 gram weight groups was greater in the rural areas than in the urban areas. On the other hand, for the babies weighing more than 2,500 grams, perinatal mortality was greater in the rural areas between 1956 and 1959, but after that date the difference was reversed. However, the overall perinatal mortality was consistently higher in the county boroughs, due to less favorable birth weight distribution. These differences in the overall perinatal mortality rates between urban and rural parts of the country and the variations in terms of birth weight probably reflect the importance of environmental factors.

---

* page 71
** page 72

In England and Wales, death rates during the first day of life changed very little between 1956 and 1965, Professor Ashford said. However, the statistical data are subject to some doubt because of the difficulty of establishing a clear distinction between stillbirths and live births. No one waits to determine whether a baby is alive or dead at birth if there is any chance that he may be helped by resuscitation procedures, and this blurs the distinction between stillbirths and very early deaths. However, it is encouraging that both stillbirth rates and the death rates of infants between 1 and 28 days old have dropped considerably. This underscores the fact that the first day of life is the main crisis period; if low gestation, low weight babies do not die during the first day, their chances of survival improve considerable.

The distribution of birthweights changed during this same period. On the average, babies weigh more than they used to, and the proportion of low weight births has fallen year by year. In 1956, there were about 80 low weight births per 1,000 live and still births; but by 1965, the rate had dropped to 72. Furthermore, perinatal mortality has been reduced in all birthweight groups. Thus two important factors are interacting. Not only has there been an overall reduction in perinatal mortality throughout the whole range of birthweights, but also the birthweight distribution has changed so that proportionately fewer babies are born at crucially low birthweights.

A comparison with Hungarian data further supports the importance of birthweight as a primary factor in determining overall perinatal mortality in a population. In Hungary, unlike most countries of the world, there has been a steady regression in average birthweight since 1958. At the present time, the perinatal death rate is rising and so are the numbers of children requiring special care. Facilities for these children are having to be expanded so rapidly that there is a great strain on the health services. The Hungarian authorities, Professor Ashford said, called his attention to the possible relationship between these phenomena and the standard method of family planning in Hungary. Abortion laws were liberalized in 1958, and it is now apparently quite usual for a woman to have several abortions before she has her first live child.

Professor Ashford described a study of the regional variations in perinatal mortality in England and Wales in terms of birthweight. He showed that a large part, but not the whole, of the differences in overall perinatal mortality could be explained by variations in birthweight distribution. He also pointed out that within the various regions there were substantial variations in birthweight and perinatal mortality from city to city and from county to county. These variations he said, were probably associated with social and economic conditions and with differences in the pattern of medical care, and quantitative studies of these factors are planned. The effect of immigration is also likely to have influenced the results in certain parts of the country.

A 1958 study of about 18,000 births in the United Kingdom showed that female infants weigh less at birth than males, but that males have a higher perinatal mortality rate all along the birthweight scale. However, at the very low birthweights, stillbirths are more frequent among females than males, but the proportion of male stillbirths increases as birthweight increases. The reasons for these differences are not understood, but they suggest some sort of selective weeding out of the fetuses in terms of sex.

First-born babies tend to weigh less than higher parity babies, but there is not much difference in perinatal mortality until parity 4 or more. Twins and triplets tend to weigh less than single babies, but both single and multiple births separately show the same two-component birthweight distribution.

The study showed a correlation between the age of the mother and the birthweight of the baby. Very young mothers tend to have smaller babies and mothers over 30 tend to have larger babies. Tall mothers have larger babies than short mothers. Non-smokers have larger babies than smokers.

Average birthweights are higher for infants of mothers in the two highest social classes than for those in the two lowest social classes. They are also higher for babies born in wedlock than for those born to women without husbands. These distinctions are less apparent in social class three, the middle group of skilled and semi-skilled workers. Social class as such appears to have little effect on perinatal mortality rates.

As far as future action was concerned, Professor Ashford suggested that the problem of perinatal mortality might be tackled in two different directions. In the first place, mortality rates should be reduced for babies of all birthweights, both by improvements in obstetric and gynecological practice and by the provision of better care for the more vulnerable low gestation-low birthweight infants. Secondly, the proportion of low weight births must be reduced, possibly by providing better ante-natal medical care for the mother and by improving the general environment experienced by the mother during the whole course of her life. It is not yet clear to what extent purely medical measures would be capable of producing improvements in the short term; and until studies of this factor have been carried out, a satisfactory basis for the allocation of resources will not be available. In the meantime, probably the most useful program would be to concentrate on predicting individual high-risk births, so that available medical resources are deployed in the most efficient manner. However, there remains the question of intact survival rather than mere avoidance of perinatal death. Much further work needs to be carried out in this area. It would be useful if a less extreme measure of perinatal damage than death could be made available for large populations.

Agreeing that the importance of low birthweight in perinatal mortality is widely recognized and accepted, several participants stressed that birthweight alone is a less important factor in perinatal mortality than the combined factor of birthweight and gestational age. Some assessment of maturity is essential. A small-for-dates baby tends to have a better chance for survival than the small baby born before the gestational period is completed. There is also evidence which suggests that the mortality rate of babies of normal weight but short gestation is five times that of babies of normal weight and normal gestation. Within each gestational age there is a perinatal death distribution just as there is within each weight group. There are many causes of short gestation, such as maternal diabetes, infection and various immunological problems of the fetus, and each cause probably has its characteristic relationship between mortality and birthweight. It is, however, extremely difficult to get accurate data on the exact causes of death.

The important question now in relation to the low birthweight perinatal mortality issue is, what can we do about it? We have known for 15 or 20 years that the death rate among low birthweight babies is high, but we are still not sure what factors contribute most significantly to this problem. We also know that numerous studies have shown that low birthweight babies of low gestational age never catch up to normal height and weight, and that they have a higher incidence of all kinds of complications than full-term, normal weight babies. This distinction is not limited to any one socioeconomic level. We cannot reduce mortality by attacking the biological problems only, but must also attack environmental, social and economic factors before significant inroads can be made in the mortality rates.

In relation to the biometric issues, a number of participants pointed out that statistics can easily lead us off into blind alleys. As one of them put it, statistics, for the most part, simply show that the same people seem to have all the bad luck.

The high risk mother is described as being either very young or very old, either a primipara or a high multigravida, as being in the lowest social classes, as being unmarried, or as having certain personal characteristics like obesity. But any particular factor affects mortality a certain way only if certain other factors are also present. We know that the mother under 20 in the lowest social class is at high risk. Yet in higher social classes, the mother under 20 is a better than average risk. Thus the age of the mother, considered as a separate factor, is not very meaningful.

The same is true of ethnic and socioeconomic factors. The interrelationship between these factors is very complex, and this complexity is not always reflected accurately in statistics. Studies based on socioeconomic class tend to equate black middle class experience with white middle class experience, and they are actually quite different. Income alone cannot be used as an index of social habits or living standards. A white man earning $10,000 to $15,000 per year may live in a middle class area where middle class standards of living prevail, while a black truck driver earning $15,000 per year may live in extremely underprivileged conditions where standards of living and attitudes toward medical care follow a different pattern. Infant mortality studies need to take into account such factors as social conditioning toward prenatal care.

They also need to avoid the pitfalls of arbitrary statistical groupings of data. This can yield some ludicrous findings, an investigator said. A study may, for example, break down patients by socioeconomic class on the basis of whether they are ward or private patients, yet they may have landed in a ward for reasons totally unrelated to their socioeconomic class, such as overcrowding in the hospital or confinement for a contagious disease.

Statistical problems can distort perinatal mortality figures in a number of ways. One explanation of the apparent discrepancy in first-day mortality figures in various countries is that some countries record births on a calendar-day basis so that a child born at 11 p.m. is considered to be one day old at midnight, even though he is actually only one hour old. Other countries report on the basis of actual number of hours of life.

Different countries also define "perinatal" in different ways. Within the United States, two different age groupings are used: from 20 weeks gestation through 28 days of neonatal life, and from 28 weeks gestation through the first week of life. Inclusion of the broader age range under the definition of perinatal of course makes the perinatal death rate appear higher than the rate obtained when the narrower age range is used. This broader range was recommended for use in the United States. However, this definition is not comparable with the one used in other countries, so the narrower definition was proposed for international comparisons. Reporting also varies from State to State; some include all products of gestation and some do not. Thus, in tabulating data, precautions must be taken to assure that comparable data are used.

Perinatal mortality figures can also be distorted by economic factors. For example, the perinatal mortality rate among Negro patients at Columbia Presbyterian Medical Center in New York is now remarkably low; but one reason is that admission fees have risen so high that many high risk poverty level Negro mothers are excluded from care by the economic factor. It would therefore be erroneous to conclude that the low mortality rate in this hospital accurately reflects the mortality rate among Negros in the community as a whole.

Some of the apparent changes in infant mortality rates in various countries may reflect, in part, changes in recording. Under usual circumstances in developing countries, only the sick infant or the one who dies may come to the attention of statisticians. As a result, morbidity and mortality rates appear high. But when a new program like the Children's Bureau's maternity and infant care program begun under P.L. 88-156 puts out a dragnet to identify all women at high risk in pregnancy in a given geographical area, it makes all women there who become pregnant "statistically visible." In such a situation mortality rates appear to improve dramatically because for the first time all women who produce babies are included in the statistics.

This also works in the opposite direction. The fact that infant mortality has gone up in certain places like the large cities is due not only to the change in composition of the population but also to the fact that many people are living for the first time in places where they get counted. Back home in rural counties where 50 percent of the deliveries take place in the homes, a baby who is born at two and a half pounds and dies a half hour later is apt to be buried in the back yard. Neither his birth nor his death is recorded; in the city, both events are recorded. It is easier to judge the accuracy of statistics if two comparable population groups can be compared. If this is not possible, common sense must be used about accepting statistics that are manifestly implausible, because they usually reflect some kind of reporting problem.

NATIONAL EXPERIENCES WITH INFANT MORTALITY

The conference made no attempt to examine the infant mortality status of all countries on an individual basis. General world-wide trends were discussed. Participants reported on the present status of infant mortality in the United States, whose rate needs considerable improvement, and Sweden, another highly developed nation where the rate is particularly low. To highlight differences in the nature of problems relating to infant mortality encountered in the developing and the industrialized nations, the current situation in Ghana was described.

Three major points emerged in this discussion of experiences in various parts of the world:

> that an advanced technical and cultural level in a country offers, in itself, no assurance of a satisfactory infant mortality rate;
>
> that universal access to free services appears to be one factor in lowering infant mortality rates;
>
> that preventive medicine, family planning, and pediatric care are far more important in developing nations than concentration on reducing infant mortality, which is, in a sense, a secondary problem growing out of multiple social health problems.

Infant Mortality: The International Spectrum

Infant mortality on a worldwide basis ranges from a high level of 200 deaths per 1,000 live births to low rates of less than 25 deaths per 1,000 live births, said Dr. Franz Rosa of the World Health Organization. A fairly large number of countries have rates around 200, with rates up to 500 in special population categories. Reporting is poor in countries where the rates are high, and only rough data based on sample surveys and sample registration are available. In many countries, neonatal deaths are not recorded. For example, it is estimated that in India about one million deaths occur annually in which neither the birth nor the death is recorded.

The multifactoral causes of infant mortality in these countries have to be quantified empirically. During the first few weeks of life, the principal causes of death are low birthweight and neonatal tetanus. Mortality rates are also high in the post-neonatal period and during childhood; about half of the children fail to survive to adulthood. Mortality is particularly high in the second year during the weaning period, when poor sanitation and inadequate food become major environmental factors. The great majority of the deaths are caused by the interrelation between malnutrition due to the limited food supply and infections.

In some areas, particularly those with high population pressures like the Near East and Southern Asia, the death rate is higher for girls than for boys. This is a different sex ratio than is found in economically developed areas.

In some countries rapid increases in infant mortality have been observed with increased parity and decreased birth intervals. The data are scanty, but the observation is an important one which needs further exploration.

In some high mortality areas, rapid reductions in infant mortality are taking place. In combination with sustained high fertility rates, this is causing rapid increases in family size and serious economic and health problems. Children who survive infancy are stunted in their later development by the same interrelating factors of inadequate food supply, infections, and parasitization which cause high mortality rates.

At the opposite end of the scale are about 20 countries with infant mortality rates of less than 25 per 1,000 live births. Differences in reporting neonatal deaths and stillbirths create wide discrepancies in the apparent first-day death rates. Hong Kong, for example, reports a first day mortality rate of less than one per 1,000; while England, the United States and Canada report rates of 8 to 11 per 1,000.

However, because different countries have different dividing lines between the classifications of (1) stillborn and (2) born alive but surviving briefly, it is more informative to look at late fetal deaths and neonatal deaths together. When this is done, the perinatal (neonatal + late fetal) deaths account for about 3/4 of late fetal and infant mortality.

In the countries with low death rates, mortality is about 25 percent higher among male infants than among females. The predominant causes of death are problems of unknown etiology and genetic problems which are resistant to immediate environmental influences. Many children who survive infancy have developmental problems, but these are not so homogeneously environmental as in the underdeveloped countries.

Infant Mortality in the United States

Several participants discussed the fluctuation in infant mortality rates in the United States. Miss Lillian Freedman, Chief of NICHD's Program Statistics Branch, reported that infant mortality in the United States decreased tremendously during the early part of the 20th century. Beginning in 1950, this decrease slowed down appreciably for reasons not clearly understood.

Between 1955 and 1965, Dr. Lesser, Deputy Chief, Children's Bureau, added, the infant mortality rate decreased by only five percent. During the period between 1955 and 1960, only three of the largest cities in the United States had any reductions in infant mortality.

Figures given in Volume 19, number 3 of the WHO Epidemiological and Vital Statistics Report indicate that of 34 countries with infant mortality rates below 50 in 1963 or 1964, the United States had the least favorable reduction during the previous five years with the exception of Greece, Dr. Rosa said. This unfavorable rate of improvement in the United States appears to have centered in the urban areas. It may have been due to deterioration of conditions in these areas as the poverty problem population moved in and private resources moved out.

Two or three years ago, Miss Freedman said, the rate again began to drop rapidly. In 1966, in the United States as a whole, there was a reduction of four percent from the previous year, and there have been reductions each year since.

The 1967 figures given in Volume 21, number 12 of the WHO report show that the United States registered a 12 percent reduction in infant mortality during the preceding three years, Dr. Rosa reported. This was almost three times as much as the reduction during the previous five years. During the three year period, U. S. improvement exceeded that of 12 other countries: Romania, Hong Kong, Bulgaria, Czechoslovakia, Hungary, Netherlands, Israel, New Zealand, England and Wales, Ireland, and Australia. It was approximately the same as the reduction in Norway, Belgium and Greece. Twelve other countries showed a greater reduction during this period: Japan, Poland, East Germany, West Germany, Sweden, Denmark, Singapore, France, Finland, Italy, Scotland and Switzerland. Data are not available in this report for Trinidad, Taiwan, Panama, Thailand, Venezuela, and Canada.

It seems likely that the improvement of the United States rate during the past few years may reflect the improved urban services provided through legislative changes between 1963 and 1965, Dr. Rosa and Dr. Lesser said. Infant mortality rates in large cities are coming down much more rapidly than for the nation as a whole, and the reductions among black infants are greater than those among white infants. This strongly suggests the importance of government intervention and programmed attention to the health needs of poverty groups, particularly since some 10 or 15 countries currently have lower infant mortality rates than the United States.

It is too early to know whether the recent gains represent a trend which will be maintained, Miss Freedman said. Preliminary figures for 1968 are not encouraging; the rate of decline seems to have been about 3 percent, as opposed to 5 or 5.5 percent in 1967. The period under one year of age continues to be a higher risk period than any other age group until age 65. Childhood mortality is low, but even in the middle-age adult groups the death rates are lower than those for infants under one year of age.

Both the relationship between birthweight and mortality and the relationship between ethnic origin and mortality show up clearly in data from the National Center for Health Statistics. Infant mortality decreases as birthweight increases. Infant mortality is lower among whites than non-whites, though this differential has decreased slightly in recent years.

The slowdown in the reduction of infant mortality during the 1950-1960 period was not limited to the United States, another participant pointed out. It was a worldwide phenomenon, and no one has satisfactorily explained why. It cannot be explained in terms of medical care systems, because several countries had outstandingly good medical care systems at that time. It cannot be explained in terms of poor socioeconomic conditions, because the economy was booming all over the world.

This suggests that we need to look for an earlier factor, some worldwide event which might have had such serious effects as to bring about this slowdown in the reduction of infant mortality. Perhaps we need to consider what happened to the mother during her own period of intrauterine experience and early childhood development. This means looking back 20 to 30 years behind the 1950-1960 period. One obvious event comes to mind; the Great Depression of the 1930's, which did not last just a few years but an entire decade. Was this a key factor in the infant mortality rates of the 1950-1960 period? If so, it should be possible to fit the mortality pattern into a model. Depression has a greater impact on some groups, obviously, than on others: on the poor, more than on the well-to-do; on residents of urban rather than rural areas in industrial societies; on Negroes and other farm swellers put out of work in agricultural societies.

If this concept is valid, there should have been a change in the mortality rates during the past few years, and this does seem to have taken place. The reduction in infant mortality has speeded up. Furthermore, the differential between white and Negro mortality rates is diminishing, suggesting that some of the factors that have placed Negro babies at particularly high risk have been neutralized. This concept of factors remote in time might be a useful hypothesis to explore with the idea of predicting--and preventing--additional setbacks in the control of infant mortality in the future.

Infant Mortality in Sweden

Professor Petter Karlberg of the Pediatriska Kliniken, Goteborg Universitet, reported that the decline in infant mortality in Sweden during the last 50 years is due primarily to a decrease in deaths after the first week or the first month of life. As in other countries, infant mortality is higher among the children of very young mothers and mothers in their 40's than among children of mothers in the age groups between these extremes.

Stillbirths are also decreasing in Sweden. In earlier years the decline in stillbirths was principally among full term infants, but in recent years the stillbirth rate for prematures has dropped somewhat also. Stillbirths tend to be highest among unwed mothers--not because the mother is unmarried but because of a variety of environmental factors. Stillbirth rates are also high among infants of older mothers.

Prematurity is higher among babies of young mothers than in other age groups. The correlation between low birthweight and mortality is highest during the neonatal period, but even during the postnatal period between 20 days and 11 months of age, the mortality rate of low birthweight infants is much higher than that of babies of normal weight. There has been, however, a slight decline in neonatal mortality among prematures in recent years.

In the overall decline in neonatal mortality it is possible to trace the change in definition adopted around 1960. Prior to that time, the criteria for live births required that respiratory movements be observed. Since 1960, the World Health Organization definition has been used. There is a slight upward shift in the decline at 1960.

The birthrate in Sweden declined between the turn of the century and World War II, took an upward swing, and leveled off somewhat after the war. Birth control and family planning have been widely used in Sweden since the 19th century. This fact, and an emigration of about one-fourth of the population to the USA in the second half of the 19th century prevented the reduction in infant mortality from producing a population explosion.

Goteborg is the second largest city in Sweden, with a population of half a million. Two maternity hospitals handle virtually all of the 7,000 deliveries that occur each year. There are no private hospitals, and no deliveries are done at home. Each maternity hospital has a neonatal unit, and pediatric care is provided through the clinic of the university. Perinatal mortality and morbidity in Goteborg are being studied. Special emphasis is being given to analysis of variations in the rate of low weight births. The neonatal mortality rate for low birthweight babies is about 20 times that of normal weight babies. Since the WHO definition of a liveborn child includes very tiny babies who would formerly have been classed as spontaneous abortions, it is difficult to compare mortality rates accurately as an overall figure. The births should be broken down by weight, at least with those under 1,000 grams separated from weighing more than 1,000 grams, and preferably by 500 or 250 gram weight groups throughout the entire range. The maturity rate should be taken into account. Survival time is another factor which should be considered; the figures are quite different if babies who live less than a half hour or less than two hours are lumped together with those who survive longer.

These "borderline cases" have a great influence on apparent neonatal death rates.

From a preventive standpoint, it is essential to analyze the causes of death. Congenital malformation, birth injuries, and respiratory disorders account for about 50 percent of the deaths. Another fourth die of insufficiently defined diseases, unqualified immaturity, etc. For the remaining fourth, the cause of death is not known. In order to get really accurate causal analyses, continuous monitoring of mother and child during the perinatal period is needed, not only from a medical standpoint but also in relation to family and social background.

It is difficult to assess the many specific factors that contribute to Sweden's low infant mortality rate, Dr. Karlberg said. One is the increasing number of older mothers. The generally high standard of living must be of definite significance.

One of the most obvious probable factors is the difference in the system of care in Sweden and in other countries. Legislation requiring that maternal and child health care services be built up in Sweden was passed in 1938. By 1950, the services had developed sufficiently to give everyone access to such care. For purposes of service, the country is divided into areas of 4,000 to 6,000 inhabitants.

During a normal pregnancy, three examinations by a physician are considered necessary, one during the early months, one halfway through, and one a month before the anticipated date of confinement. There is one postpartum followup visit after six to eight weeks. The mothers are also under supervision of the midwife of the center the entire time. If any complications arise during pregnancy, the nature of these determines the number of required consultations. Women can go to private obstetricians if they prefer, but about 90% go to the welfare clinics. Care is free to the patients, and costs the government about $12 per person per year.

Hospital delivery is also free and is almost universally used. There is some debate about whether small maternity hospitals should be maintained in each town, but this would create problems of maintaining high standards of care. Personally, Professor Karlberg said, he favors hospitals which will handle at least 1,000 to 2,000 deliveries per year, even if this means establishing a helicopter service to transport the scattered population of mothers from some rural areas, especially in the northern part of Sweden.

After delivery, the child welfare service provides health supervision for the children. For normal infants, three to five consultations during the first year of life are considered sufficient, although the total may be more if vaccinations are included in the count. Prematures and infants with other health problems require more extensive supervision. Special attention is given to children from environments considered to be unsatisfactory from a social or psychological point of view. After the child reaches one year of age, visits drop to one or two per year.

For the country as a whole, in 1967, visits to medical officers by mothers averaged 3.7 per pregnancy; for infants, 4.3. Home visits to pregnant mothers average 0.4 per year, and to infants, 3.2 per year. In 93% of the cases the first health visits to the infants occur during the first month of life.

More than 99% of the mothers take advantage of the child welfare service during the first year of the child's life and about 96% during the second year. Then use drops to about 60%, and it is considered that something needs to be done to reduce this dropout rate.

Recently the parents of handicapped children spearheaded a successful drive to require that every child in Sweden have a checkup at the age of four years. Since the birth date and a special birth number are recorded for every person in Sweden, it is easy to locate all children in any given age group. The checkup includes various screening tests done by physicians, nurses and paramedical people in the child welfare clinic. The original plan was for a three-hour checkup which would cost the Government about $20 to $25 per child. This is somewhat ambitious, and it may be cut down to some extent. This means some loss in the intensity of care, but it may be the only way vast numbers of children can be handled at the present time. When problems are identified, the level of care is intensified.

Dr. Karlberg pointed out that a medical birth registration system based on cross sectional evaluation of all infants during the neonatal period is of great importance, and that health followup as a complement to the child welfare service should be instituted for children considered to belong to various risk groups. Such systematization of directed, intensified health checkups is under development in Goteborg.

At the same time, data which will identify more clearly the factors affecting infant mortality will be collected. What is important is to identify the factors present not only in the babies who die but also those in the babies who live; we need information on all babies and all births.

Perhaps we need to turn our concept around to place less emphasis on how many babies die and more emphasis on the survival rate, Dr. Karlberg suggested. It is the ones who are alive in whom we are really most interested. What is it that enables them to survive? That is the important question.

Infant Mortality and Pediatric Progress in Ghana

For a country like Ghana, where medical progress is relatively recent, it is less meaningful to discuss statistics than to examine how infant mortality issues relate to the cultural pattern and the stage of the country's development. This was the perspective presented by Dr. Hugh Jolly of the Department of Paediatrics, Charing Cross Hospitals, London. Dr. Jolly spends several weeks each year in Ghana where he is Visiting Professor of Child Health. The Ghanaians, he said, are a tremendously cultured and charming people. They are tribalistic in outlook but nonagressive by temperament. This has both advantages and disadvantages. It makes for a less volatile political climate than is found in some other African countries, but it also sometimes means that they are less aggressive about organizing health services than they need to be.

Because of the small size of the country--it has a population of about 8.5 million--the leaders in politics, medicine, the law and other fields are known to each other and to the population at large. Standards for performance and personal behavior are high, and educational standards among the high-intellect group are extremely high. Many of the country's leaders received their education at Achimota School, a large coeducational establishment with wide influence which was founded in 1924. This school "budded off" the University of Ghana, in which the same high educational standards are maintained. The first group of medical students recently graduated with a performance level as high as that of any other medical school. As a result of this thorough approach and the high standards that are maintained, the Ghana Medical School is moving slowly in building up its staff of Ghanaian professors, Dr. Jolly said, and he feels he will probably need to continue teaching there longer than he had anticipated.

Dr. Jolly's wife, Dr. Geraldine Howard, goes with him to Ghana where she works in the family planning field under the auspices of the International Planned Parenthood Federation. Under Ghanaian policy, family planning services are planned to be provided under government auspices in every town. Dr. Howard works very closely with and through Ghanaians. The level of OB-GYN education is high in Ghana, and Dr. Howard discovered that the principal need was not to educate physicians about IUD techniques but to train community nurses how to prepare women for the insertion of the intrauterine devices and support them afterward so they will not panic if pain or bleeding should occur after the medical team has moved on to its next location.

A family planning film with commentary in the vernacular of each area has been very well received both in the villages and in the more sophisticated areas because it uses an approach which enables the viewers to see the relevance to their own lives. It starts as a documentary of village life, moves into the village clinic, then in the city clinic, to actual demonstration of insertion of the IUD's.

The university teaching hospital, Dr. Jolly said, takes care of some 150 patients and 200 to 300 outpatients per day. Dr. Jolly said he is often astonished by the stoicism with which mothers tolerate emergency resuscitation procedures on their children. One difficulty many of the mothers have, however, is knowing whether their babies are ill or not. One mother brought in her six months old baby and described in detail the symptoms that were worrying her. Examining the child, Dr. Jolly discovered it was completely well. The next mother who came in began to describe exactly the same symptoms, not realizing that the infant she held in her arms was already dead.

When a premature baby unit was first opened in the hospital, the death rate was an appalling 75 percent. Ten months after reorganization, this had dropped to 18 percent. In large measures this was due to introduction of training for the nurses in specific techniques of low birthweight care, improved sanitary procedures, better attention to the reliability and safety of incubators, and better direct supervision by the physician.

The Ghanaians are eager to accept Western medical procedures. For some reason they much prefer injections to medication by mouth. This probably goes back to the tremendous success of the campaign to eliminate yaws. This was achieved by injections of penicillin, so injections have an aura of success in the minds of many Ghanaians.

Because of sanitation problems, it is desirable to maintain a high level of breast feeding, but this is becoming difficult to do because the Ghanaian mothers are bombarded with advertisements for proprietary milk products and naturally assume bottle feeding must be better. One might say that the Ghanaian mothers have no difficulty wanting and accepting Western medicine, but they are a long way from understanding what is meant by positive health.

Another thing Ghanaian mothers do not understand is the role of play in normal development. Ghanaian children are sent out to play with whatever primitive objects they find in the dust, but no one makes any effort to stimulate them by playing with them. A possible deficiency of manual and manipulatory skills in adult Ghanaians may be in part an outgrowth of this lack of play activity in childhood.

Play activities are systematically introduced in the hospital wards. This is difficult to maintain, however. The nurses raise no objection to the activities of the play specialists, but because of their own upbringing, few have the inclination or skill to continue the activities when the specialist leaves the ward.

Television is being widely used in health education in Ghana, not so much in direct education of the people as in education of leaders who can absorb and pass on to those with whom they work the principles of preventive and social medicine.

Because of the scarcity of doctors, it is important for nurses to be able to do a great deal of screening and call the doctor's attention to specific problems. Medical students have tended to look down on nursing students. To overcome this, Dr. Jolly has instituted joint teaching exercises to help the disciplines understand each other's professional roles. The medical and nursing students go as teams into the homes of child patients and present their findings in weekly meetings.

The shortage of teaching personnel is another problem which causes a good deal of conflict between those who want to build up the teaching staff of the hospital and those who feel every available doctor is needed in practice. Several hundred Ghanaians have received their medical education in Russia. This also causes certain problems, as the training standards of the two countries are different.

In spite of the many handicaps they face, medical education and medical care in Ghana are proceeding very rapidly, Dr. Jolly said. The level of interest is high, and the constant striving to maintain high standards is a valuable asset. It is very clear that infant mortality cannot be reduced by building a handsome new hospital. That is why the emphasis in Ghana is so heavily preventive and why teaching is given greater emphasis than treatment in the teaching hospital of the university. However much one may wish to treat all the sick children, this cannot be done, and the first responsibility at this stage must be to train enough doctors so that in time the country's physicians can prevent the diseases they now need so desperately to treat.

SOCIOECONOMIC FACTORS IN INFANT MORTALITY

The conference participants stressed repeatedly that means of reducing infant mortality can be found only if this problem is considered within the total socioeconomic context. We have yet to develop adequate services because we approach them in fragmented form from an ill-defined base of social policy. We pay lip service to the need to provide optimal services for all mothers and children, but we have yet to develop a health care system that will work effectively in this country at this time. We need to come to grips with many questions ranging from the legal rights of the fetus to the role of the consumer in the development of services. The problems are monumental, and we cannot deal with all of them at once, even though we recognize their interrelationship. The Children's Bureau's Maternal and Infant Care Program referred to earlier* is a start in the right direction, though it reaches only a limited population. Other effective programs need to be developed to overcome the remaining obstacles to the reduction of infant mortality.

Infant Mortality: A Measure of Social Policy

In considering infant mortality, said Dean Walter M. Beattie, Jr. of the School of Social Work of Syracuse University, we need to address ourselves to critical social policy issues surrounding socioeconomic problems. Social work, as a profession, and social work education are moving in that direction. Social work is moving away from a preoccupation with psychosocial casework models of practice toward the problem-solving model of

*This program is now administered by the Maternal and Child Health Service of the Health Services and Mental Health Administration, DHEW.

social intervention. The goal of practice is broadening beyond remedial action, and even beyond prevention. It is now directed toward improving the functioning of the individual, the family, and the community. Social work education no longer focuses narrowly on treatment of a particular situation but tries to prepare students for practice in the broader context of their role as agents of social change.

In the United States we must face the critical question of the tremendous differentials in infant mortality rates between whites and nonwhites--American Indians, Negroes, and Orientals. The Oriental population has a lower infant mortality rate than the whites or the blacks, and we must ask why these low rates cannot be extended to all races. We must ask what we need to do to reduce the high rate of preventable postnatal mortality among American Indians whose death rate exceeds that of other races in this country. We must remember that from a numerical standpoint, deaths of white infants continue to be the largest problem. We must look at rural-urban differentials, and at the differentials between various sections of the same city. As we examine these differentials, inevitably we see the socioeconomic characteristics of the various population groups as a very basic issue.

We consider the United States a highly developed urban nation. Yet many areas of the country have the same socioeconomic characteristics found in underdeveloped nations. Some of the differentials in infant mortality appear to relate to the difficulty of making a rapid shift from "underdevelopment" to sophisticated urbanization. Maternal and child health care, treatment and prevention have been and must be related to immigration, cultural variability, rapid urbanization, control of infectious diseases, and control of environmental hazards, but we must look beyond these concerns to critical questions about the organization and delivery of services. Our present systems are obviously not working well enough. It is unrealistic to dichotomize public health from personal medical care, or physical health from mental health. It is unrealistic to view health services as an isolated constant; they must be developed within the total socioeconomic context. The goal of community health programs must be not health only, but health as a part of adequate social functioning. We need to focus on the healthy development and functioning of the child much more than on infant mortality.

This means, among other things, that we must broaden our focus beyond maternal and child care to include psychosocial and behavioral intergenerational family relationships. We need not only a multiservice concept of the delivery of service but a multigenerational concept which encompasses more than just the mother and the infant. Yet the fragmentation of family groups so characteristic of our society today makes this concept difficult to implement.

We need to think not only of controlling environmental hazards but of environmental design as an integral part of the design of health services. We have unique opportunities to do this, with whole new cities being developed. Access to services, the way they are delivered and the level of participation of individuals in development of their own services can negate or enhance their value in improving social functioning. We are moving away from the concept of patients and clients to the concept of consumers. This means we are dealing with a different set of psychosocial motivational characteristics which can be used constructively in the delivery of services.

We live in a country with high levels of mobility, and we need to look at this as a possible factor in infant mortality and in the different mortality rates among different population groups. An individual moving from the rural deep South to the urban North without any preparation for living in a totally new kind of environment may have little or no capacity to participate in the larger community or make use of its services. Even such physical features of the new environment as high speed freeways can seriously impede the use of services, particularly among those who do not have automobiles at their disposal.

Lack of continuity of care is another factor we need to consider in relation to infant mortality. The best environmental designs, on paper, will be meaningless unless those who supply the services can get across the importance of health care as a continuing positive force rather than an emergency measure in crisis situations.

We talk about our health care system, Dean Beattie said, but we really do not have and have not had a health care system. We are reaching, at this point, for a greater rationalization of a highly irrational set of services and programs. There is too much emphasis on health planning and not enough on the goals toward which such planning should be directed. In addressing ourselves to specific problems such as infant mortality, our goal should be to take into account all the social, economic and behavioral factors that may be barriers to the acceptance and use of health services which can reduce the incidence of specific health problems. For example, the concept of medical indigency is a very negative concept with psychosocial as well as economic overtones. It places access to services in the negative context of indigency rather than the positive context of something that is the right of every citizen. Does this not create barriers to the inclination of people to seek services?

The sheer facts of poverty and the realities of ghetto living can, in themselves, be barriers to the use of health services. How can you interest someone in goal-oriented concepts of health-building if his concern is with survival? If his concern is with how he and his family will eat and live for the next 24 hours? Preventive medical care and social casework are not very meaningful if you are concerned with the rats that run across your children's beds every night. The outcome of nine months of pregnancy can seem a far away concern when your family is hungry today and lacks adequate shelter today. Time means different things to different people, and it is intricately related to space--life space, social space, psychological space. The way people feel about time and space inhibits or enhances their ability to function effectively--to do the things they need to do to prevent infant mortality, handicapping, and medical problems, and to build health. People who live perpetually with a crisis orientation toward life see things differently than those who perceive time as a way of ordering circumstances.

In some States there is pressure for legislation which would require employers to provide health insurance for all their employees. Is this the right approach, or should access to medical services be a matter of public policy and national priority?

We do not lack knowledge or resources to solve the infant mortality problem. We know how to reduce it. The real problem is inadequate distribution and consumption of resources.

Infant mortality, Dean Beattie concluded, is a measure of the adequacy of social policy. If mortality is to be reduced, we must assure that individuals, families and communities have whatever services they need to promote maximum social functioning.

The Legal Rights of the Fetus

Does and should a fetus have a right to be born? If so, at what point in time does this right begin? When does the fetus begin to have rights separate from those of its mother? These are among many questions that need to be explored in relation to infant mortality, said Boston College Law School Professor Sanford Katz, whose specialty is the legal rights of the fetus.

The law has been reluctant to put forward a comprehensive definition of life, Professor Katz said. This is surprising, since law seeks to order society and settle disputes among human beings. But the status recorded on the birth and death certificates and used so frequently in legal matters is defined, not by lawyers, but by physicians, hospital administrators and nurses.

The lack of working definitions of life and death has enormous implications during this period of experimentation with organ transplants. A few legal scholars have been giving extensive thought to the exact point at which a man ceases to function as a man, and to who should be authorized to decide this question. The decision that someone is living or not living is most often considered a medical decision assigned to a surgeon who will make a transplant. This is one end of the life cycle.

Turning back to the beginning of life, we find legal doctrine in one context that supports the concept that life--and the fetus' right to protection--begins five or six months after conception. This is a viability concept based on the assumption that a fetus at this age is capable of existence outside its mother's womb. Many courts have held that a fetus is nonviable before this time. However, the time at which a fetus is given a "legal personality" varies with different kinds of cases. The viability concept continues to be widely used, but some States have abolished it, saying that viability is not a valid standard for determining when a fetus is alive and when it is not.

The question of the right of a child to be born is, of course, particularly important in relation to abortion, Professor Katz said. There is a considerable paradox in the fact that the most liberal people in the world are all for preventing fetal deaths, but they are also for liberalizing abortion laws. Few thoughtful critics could be found who are totally against abortion under all circumstances. The real issue is whether abortion should be a subject for State regulation; and if so, on what grounds should abortions be permitted? The usual reasons for allowing abortions are protection of the physical and mental health of the mother, the fact that the pregnancy is the result of incest or rape, or the fact that the mother is legally not an adult. In all of these reasons, the major emphasis is on the mother rather than the fetus. This is not to say the reasons may not be valid; but it does emphasize the need to define the rights of the fetus more clearly.

The question of inheritance rights also needs to be clarified. Does a fetus have a right to inherit property, and if so, when does this right begin? Does a fetus have a right to recover damages for prenatal injury, and if so, at what stage of its development?

Does a fetus have a right to prenatal medical treatment, and at what age does this right attach? Currently, in animal experiments, the fetus is being removed from the mother's womb, operated on for some defect, and returned to the womb for the mother to carry full term. If this is also to be done in humans, under what circumstances should the law allow someone other than the mother to decide whether the fetus has a right to prenatal medical treatment?

Does and should a fetus have a right to have his heirs bring action to recover damages for his wrongful death?

Obviously, such questions as these reach beyond legal considerations. They must include serious consideration of social, medical, philosophical and theological principles; and the decisions will reflect particular sets of values.

We assume that the prevention of infant mortality is a desirable social goal, although, in fact, this goal may not be shared by all segments of society. If the law protects the rights of the fetus from the very moment of conception, fetal deaths may often be prevented--or frustrated, as the case may be. The best indication of the status of the law on this question is in blood transfusion cases. These most often involve members of the Jehovah's Witness sect who oppose transfusion on the basis of a religious belief that foreign blood should not enter a body.

What can the physician do in such a situation? Neither he nor the hospital administrator can authorize the transfusion because of the legal liability that would attach to the action. So they go to court to have the parent temporarily removed from guardianship of the child. This is a technical procedure used for the specific purpose of permitting the transfusion to take place while the child is under guardianship of the hospital administrator or the physician. This guardianship then ceases and the guardianship is restored to the parents. This procedure has been followed in many cases where the courts have ruled that the life of the fetus must be protected even if the parent refuses to give consent for the transfusion. In some cases the transfer of guardianship is obtained before the birth if there is a medical likelihood that the child will be born needing a transfusion; for example, when the Rh factor is involved.

Followup studies of these families are rarely done, although action of this kind has interesting psychiatric and social implication. Is there not a question about the well-being of the child if it is sent home with parents whose strong religious conviction might make them regard the child as a stranger "hexed" by foreign blood? The courts, in effect, are saying that good health is more valuable than religious practice; yet one might question whether the well-being of the child is, in fact, adequately protected.

Adults are usually considered to have the technical right to die if they elect to forego medical care. The court generally assumes that adults may make martyrs of themselves if they so choose, but they will not allow them to make martyrs of their children. In one famous case in Washington, D. C., a woman was admitted to a hospital with a condition which required her to have a blood transfusion. She refused, and her husband also refused permission. The director of the hospital went to court to get an order requiring that the transfusion be done. The judge so ordered, on the grounds that the court is supposed to act in the best interests of the children, and that it would not be in the best interests of this mother's children if she died. He also indicated that he felt the woman did, in fact, want the transfusion, since she kept saying, "I cannot consent to the transfusion; but if it is the physicians' decision, it is their decision, not mine." The judge also questioned whether failure to allow the transfusion might not frustrate the physician's ability to fulfill his responsibility to preserve the woman's life.

This unusual case demonstrates the lengths to which a court will sometimes go to protect children. Yet there are many concepts of the rights of the child or the fetus which are still ill-defined, Professor Katz concluded. These must be considered in any examination of the problems of fetal and infant mortality.

Family Planning in Relation to Infant Mortality

It is difficult to demonstrate the magnitude of the independent effect of family planning on mortality and morbidity, said Mr. Arthur Campbell, Deputy Director of NICHD's Center for Population Research. Family planning is included among a whole complex of factors affecting child health which are closely associated with each other.

In the United States, fertility rates have dropped from the post-war level of 123 per 1,000 in 1957 to 85 in 1968. This reflects changes in completed family size for women born during Depression and Post-Depression years, and differences in the distribution of births in relation to the age of the mothers. The age at marriage went down rapidly during the 1940's and continued to go down during the 1950's. Now the age at marriage is increasing. Birth intervals have also lengthened in recent years. Such changes in timing are temporary factors which tend to be leveled out over the long run, but they do strongly affect year to year fluctuations in births. The use of contraceptive pills does not seem to be the major determinant of the current decline in fertility in the United States, although it has undoubtedly contributed to the decline.

There are a number of hypothetical ways that family planning can influence infant mortality. First of all, there is the broad social issue of the population problem itself; that is, the effect of rapidly growing populations on rates of economic growth, the development of adequate housing, nutrition, medical care, and so on. When a population is growing very rapidly, it is difficult for a country to make the kinds of advances necessary to bring about higher levels of health and living. This affects mortality at all ages, including the first year of life.

Second, at the level of the individual family, the limitation of family size can affect the survival and health of the child by making it possible for the parents to give each child better medical care, nutrition, clothing and shelter. Few studies of these relationships are adequately controlled for socioeconomic status. They do provide classification by color, but each race includes a wide range of socioeconomic levels. Without socioeconomic data, it is impossible to determine the independent effects of other factors. For example, we know that children of the fifth or higher birth order run higher risks of death, but we also know that they and their parents tend to suffer from various socioeconomic disadvantages which often undermine health. So which is the more important factor in mortality and morbidity--the birth order or the socioeconomic status? We do not know.

Third, by helping couples avoid having unwanted children, family planning presumably reduces the number of unwanted children, who are less well cared for, and whose chances of healthy survival are therefore lower than those of wanted children. The proportion of couples in this country who report that they have more children than they want is relatively high. Among married couples with wife aged 18 to 39 in 1960, 20 percent reported that they had not wanted their last child. Such reports span all socioeconomic levels but are more common among families of low socioeconomic status. In 1960, for example, 32 percent of white wives with less than a high school education reported that they had not wanted another child at the time of their last pregnancy. The comparable proportion for wives with a college education was only 10 percent.

Fourth, family planning to space births more widely can be expected to help reduce fetal and infant mortality and morbidity by enabling women to avoid conception until their general health is good enough to enable them to carry a fetus to full term and produce a healthy baby. Some statistics relating to the effects of the interval between pregnancies are provided by data from the Maternity and Infant Care project in New York City. These data show that the neonatal death rate is 35 per 1,000 for deliveries occurring within one year after a preceding delivery. For births with an interval of one to two years, the neonatal death rate goes down to 17 per 1,000. If the interval is two to three years, the rate goes down to 7 per 1,000.

These data are somewhat biased by the fact that a premature baby has a greater chance of being born within one year of the last delivery than does a full term baby. However, the data do strongly suggest that the outcome of pregnancy tends to improve as the interval between pregnancies lengthens.

Data bearing on the relationship of the interpregnancy interval to infant mortality and morbidity are now being collected. During 1968, many States added to their birth certificates information on the date of the mother's last previous live birth and last fetal death. By matching these birth records with infant death records, a great deal more information on the effects of the pregnancy interval could be obtained than was previously possible. At the present time, however, no plans are underway to accomplish this purpose.

Fifth, family planning can help women avoid conception when they have specific medical conditions that make pregnancy inadvisable. A study of 123 infant deaths and stillbirths in New Orleans in 1964 indicated that 75 percent of the deaths could not have been prevented by ideal prenatal care, better obstetrical management, better child care, or better management of the child's terminal illness. The principal reason for the majority of the unpreventable deaths was that the mother was suffering from a serious medical condition before the pregnancy began. Such fatalities can be prevented by avoiding conception altogether or by postponing conception until the medical condition of the mother is corrected.

Sixth, family planning can help women avoid childbirth at very early or advanced ages when the risk of complication is greater. Numerous studies have shown a relationship between the mother's age, the order of births, and fetal and neonatal mortality. Mortality is greater among infants of very young mothers and those in the older age groups than among those in the prime childbearing years. It is also higher for first parity or high parity births than for the intervening births.

Mortality reports for infants include information about the age of the mother and the order of birth. This would require matching infant death records with birth records for the same infants. This is not yet done on a nationwide scale in the United States, but would not be overwhelmingly difficult to do. It involves, essentially, getting 150,000 pieces of paper together each year--75,000 infant deaths and 75,000 matching births records.

These order-specific and age-specific records are greatly needed because without them it is difficult to assess all the factors affecting trends in infant mortality. For example, in the period following World War II, the proportion of births of orders one to three increased. In the early 1960's, the proportion of fourth and higher order births greatly increased. More recently, the proportion of higher order births has declined substantially. This, in itself, would tend to reduce the infant mortality rate because the rates associated with higher order births are higher than those associated with lower order births. The drop in the proportion of higher order births would not account for all of the decline in the infant mortality rate between 1965 and 1968--from 24.7 per 1,000 live births to 21.7--but it probably does account for some of it. Unfortunately, it is impossible to determine how much it does account for.

Statistics for births occurring in the United States in 1966 show that the percentage of children weighing 2,500 grams or less at birth is related to the mother's age and the birth order. The proportion of low birthweights is lowest among babies of mothers between the ages of 20 and 34 and of second, third and fourth order births.

Even though the exact effects of family planning on infant mortality and morbidity are difficult to determine, Mr. Campbell concluded, the consistency of the evidence suggests that birth limitation and spacing, within the context of broad medical care, can contribute considerably to the health of infants and can be expected to reduce infant mortality appreciably.

It is true that many interrelating factors must be considered, other participants agreed. Spacing, for example, cannot be considered as an isolated variable. We can cite statistics to show that mortality and morbidity are lower when pregnancies are 15 months or more apart, but we cannot clearly demonstrate that the spacing is the influential factor. This may be biologically irrelevant; the human body may be well adapted for frequent childbearing. Animal studies have shown that free-breeding Rhesus monkeys often have 10 to 20 closely spaced consecutive pregnancies without fetal wastage, and instances can be cited in which human mothers have many healthy babies in quick succession.

We must also recognize that spacing that is optimal from the standpoint of reducing infant mortality may not be optimal from the standpoint of family dynamics and the interrelationships of siblings. Too wide an age gap between children may cause problems in upbringing.

The effects of birth control pills on the outcome of pregnancies which occur after use of the Pill is discontinued need to be explored more fully. One small study of 100 to 200 mothers who conceived during the first cycle after discontinuation of medication showed a two-fold increase in early pregnancy losses above the anticipated rate. If the interval between discontinuation was more than one month, there was no difference between the observed pregnancy losses and the expected frequency. The sample was too small for these findings to be considered definitive, but they do suggest the need for additional studies. The study population was a group of young wives of service men who had been taking the Pill from one to three years.

In some countries, abortion is a frequent method of limiting family size. In some countries fetal wastage and perinatal mortality are high among women who have had previous abortions. Yet Japan, which has about one million reported abortions per year, has one of the lowest and most rapidly falling infant mortality rates in the world.

The abortion technique that is used may be one factor affecting outcome. In Hungary, abortion is the principal method of limiting family size. The first live birth is often preceded by several abortions. This is producing a higher proportion of perinatal mortality and a higher proportion of low birthweight babies subject to such problems as brain damage. In Yugoslavia, where the suction technique is widely used, a high incidence of ectopic pregnancies has been reported. Although a definite causal relation has not been established, it appears that the negative pressure of the suction may cause collapse of the fallopian tubes. In Japan and Uruguay, where the suction method is rarely used, no increase in low birthweight babies has been reported in spite of the high abortion rates.

The high rates of fetal wastage and perinatal mortality among women who have had abortions may relate to parity. The first live child a mother bears may, in fact, be the product of her fourth or fifth pregnancy. The infant may therefore be subject to the risks of high parity infants. It might also be that the high rates are not due to the abortions but to the frequence of pregnancy.

There is no clear evidence that abortion per se causes increases in fetal wastage or perinatal mortality. Although animal studies show that implantation tends to be poor when the lining of the uterus has been damaged, a skillfully done D & C performed under optimal medical conditions does not damage the uterus. There is, however, much we do not yet understand about the effects of abortion on fetal wastage and perinatal mortality, and these questions should be carefully studied.

Reducing Infant Mortality Through Comprehensive Maternity and Infant Care

Within our overall goal of improving the delivery of health services in this country, we have as one specific objective the reduction of infant mortality, said Dr. Arthur Lesser, Deputy Chief of the Children's Bureau. For some time to come, we will need to address ourselves to specific problems in our population and design programs that will alleviate these problems before we can begin to achieve our ultimate goal of making available to everyone on an equal basis all the services we would like to provide.

We have learned to recognize that there are certain characteristics of childbearing among poor people. They start much earlier than middle class people, and they continue much longer. The interval between pregnancies is shorter. There is a larger proportion of illegitimate births among them, and this is associated with high infant mortality rates, but does not need to be. Some years ago, 40 percent of the women delivered at D. C. General Hospital had no prenatal care. Twenty-one percent of the births were low weight births. At the same time, among several thousand girls in the Florence Crittenton Homes, the low birthweight rate was only five percent. These girls were primarily from middle class homes, and 90 percent of them were white. This illustrates that illegitimacy in and of itself is not a factor in low weight births or in infant mortality, but that a host of other interrelating factors are involved.

The problems to which we are addressing ourselves are, of course, symptomatic of the many social changes that have taken place in this country since World War II, and particularly within the last decade and a half. The migrations of poor people to the cities, the migrations of middle class people to the suburbs; the migrations of physicians to the suburbs to follow their private patients--all of these are having an effect on infant mortality rates. In 1957 and 1958, for the first time in 30 years, the infant mortality rate went up. There were sizeable increases in infant mortality in the large cities, including those which had had favorable rates and favorable downward trends and outstanding health departments. In the City of Baltimore, for example, in the decade 1950 to 1960, the infant mortality rate rose by 19 percent, even though there were great increases in the numbers of individuals receiving care through public and voluntary resources.

In 1963, the Maternity and Infant Care program, administered by the Children's Bureau of the Department of Health, Education, and Welfare,* was established. The program provides, in selected geographic areas, comprehensive maternity and infant care for women at high risk. Interestingly enough, the key that opened the door to this program was not the question of poverty or the question of infant mortality but rather the problem of mental retardation and its somewhat extrapolated relationship to the problems of low birthweight babies. It was recognized that low birthweight babies, particularly those weighing 1,500 grams or less, had seriously increased chances of brain damage, and that low weight births seemed to be increasing. The possibilities of preventing mental retardation associated with hazards of pregnancy led the President's Panel

*Now by the Maternal and Child Health Service of the Health Services and Mental Health Administration, DHEW.

on Mental Retardation to recommend that a program be developed to provide comprehensive maternity and infant care.

This was only six years ago. Since then, we have seen what amounts to a revolution in our concepts about provision of medical care through neighborhood health centers and a host of other approaches. But as recently as this, we were not ready to respond directly to the problem that lay before us; we had to come at it through a roundabout route.

The interest in the problems of these patients and the rise in low weight births, particularly among poor people, led to a number of studies of factors affecting them. But too many of the studies have focused on the population and not on the resources. A California study showed that practices in many of the public hospitals had not been adapted to changing needs. Regulations were more effective in keeping patients away from prenatal care than encouraging them to come into it. The requirement, for example, that $125 or $150 be paid at the time of the first visit for maternity care was sufficient to exclude a large proportion of women from prenatal care.

On the basis of this requirement, the inaccessibility of care to women who had no means of transportation, the long waiting periods--often six to eight hours in a stuffy, crowded room before the patient received medical attention--it is not surprising that between one-fourth and one-half of women in the large cities were having their babies without prenatal care and were seeing a physician first at the time they went into labor.

Public hospitals were seriously overcrowded and hopelessly understaffed. One large hospital was handling 20,000 deliveries a year. The beds were jammed together and there were even beds in the halls. Yet private hospitals in the same city were pressing the health department to change its sanitary code to permit them to admit surgical patients to the obstetrical services because the OB services had only 60 to 70 percent occupancy. This is a clear cut and conceptually simple example of the need to change the way services are delivered.

What was needed was a program which would pay for the hospital care of low income patients in the under-used private hospitals. The Maternal and Infant Care program authorized by the Congress in 1963 was directed particularly toward such adjustments. This maternity and infant care program began in 1964 with a five year authorization. Its objectives are to make comprehensive services accessible to women who have or are likely to have complications associated with childbearing which increase the hazards of mental retardation or other handicapping conditions in the infant. The program has been carried out on a project grant basis, although they are not demonstration projects. The objective is to place the money where the need is greatest, with the grant funds covering up to 70 percent of the cost of the program. The program was renewed in the 1967 Amendments to the Social Security Act.

At present the program provides maternity care for about 125,000 women per year. It has opened the door to family planning services in many large cities for the first time with public funds. About 85,000 women per year receive family planning services through this maternity and infant care program. Postpartum visits have gone up to about 75 or 80 percent of the patients, in large measure because of the availability of family planning services during postpartum care.

The concept of interconceptual care in conjunction with family planning deserves greater emphasis than it has received. The relationship between infant mortality and the interval between pregnancies needs to be examined more carefully. A study of 16,000 deliveries at the Pennsylvania Hospital showed a marked difference in low birthweight rates: when the interval was more than 23 months, the rate was about half of that when the interval was less than 12 months. Another study of 4,000 deliveries showed a considerably higher neonatal death rate among infants born at intervals of less than 24 months than among those born at intervals of two to three years. Although the data on this question are still somewhat limited, the program is proceeding empirically to encourage the projects to include family planning in relation to the interval between pregnancies as part of the maternal and infant care.

In the United States, there are five million women of childbearing age who are living in poverty. Some get care from other sources, but enormous numbers do not. The goal of the program is to provide maternity and infant care for about 750,000 women per year, which is one-fifth of all deliveries in this country, and to make family planning services available to whatever fraction of the five million women want such services.

The appropriation for fiscal year 1969 for the maternity care project is $36 million. To encompass its goal of providing care for 750,000 women an additional $100 million would be needed the first year; $200 million would be needed in the second year; $300 million in the third year; and $400 million in the fourth year.

Currently there are 53 projects, all in large cities. Not all States have projects. The program is designed to provide care for poverty level women, but there is no rigid national standard of financial eligibility. It is interpreted differently in different areas and also takes into account accessibility of other services and a variety of family factors.

The program delineates standards for care, although there are some differences of opinion about what qualifications personnel should be required to have. The projects include physicians, nurses, social workers, nutritionists, and a large number of aides and assistants of various kinds. The latter are a relatively new group, active in casefinding. There are still some debates about what their qualifications should be.

Infants are covered under the program for one year after birth. In some cases, care of the mother is continued over a longer period. The old concept of the postpartum period being six weeks is pretty well gone in the more enlightened areas.

There is skepticism among scientists about measurable effects of prenatal care on the outcome of pregnancy, particularly when the physician does not see the patient until the sixth or seventh month. In one of the projects, 10 percent of the patients had hypertensive disease; 36 percent had a previous history of pregnancy wastage which of course predisposes to repetition; 24 percent were underweight; 20 percent were under 17 years of age; 11 percent were multigravida; 20 percent had previous operative deliveries, etc. With patients with histories of this kind coming late in pregnancy, it is obvious the obstetrician cannot do a great deal to alter the course of pregnancy.

However, these patients are in need of constant medical care. Some programs have added internists to the maternity staffs and others are assuring appropriate referral so the woman with cardiac disease, renal disease, etc., can get care in anticipation of having another infant.

Infant mortality has clearly declined in association with the program. In New York City, neonatal mortality in 1966 was 13 percent less for babies born under this program than for the city as a whole. Very large differences in infant mortality have been observed among Negro girls at age 15 at the time of conception who receive the usual haphazard care and those who receive services through the program. Similar data are available from Puerto Rico in a study of 24,000 births.

There has been no demonstrable reduction in low weight births under the program as a whole. Between December 1966 and December 1967, for example, the proportion of low birthweight babies was 14 percent, which is the natural proportion among black infants in this country. Low weight births have been reduced in a number of individual projects, however, as have neonatal mortality rates. One project experienced a 43 percent reduction in early neonatal mortality rates during the second 18 months of the program.

Regardless of the scientific aspects, from the standpoint of social policy one of our principal objectives in the United States needs to be reducing the great differences in infant mortality levels among different population groups. As has been pointed out, there are differences in mortality rates of blacks and whites, and there are also tremendous differences between low income groups and middle income groups. We need to provide whatever kind of care will reduce these differences and equalize chances for survival. We ought not to tolerate a difference of 100 percent between the State with the highest mortality rate and the State with the lowest mortality rate. It is less important that we achieve a rate of 19 or 18 or 17 deaths per 1,000 births than it is that we have no State with a rate of 35.

During a period of economic growth in the 1940's, infant mortality came down sharply in the United States. In the 1950's, when there was also considerable economic growth, the rate did not drop. One possible factor in the earlier drop cited by Shapiro and others is the Emergency Maternity and Infant Care program set up during the war years for the wives of men in the armed forces. This was the largest medical care program under public auspices ever undertaken in this country up to that time, and it led to many significant changes in local health departments and hospitals.

In a sense, the current Maternity and Infant Care program is repeating that experience. There is still much we need to know about the effects of maternal nutrition or malnutrition on the baby, the effects of pregnancy intervals, the effects of onset of labor. But we have enough knowledge to influence the outcome of pregnancy by providing good care on the basis of what we do know. Unfortunately, we are not using all the knowledge we have, but response to the Maternity and Infant Care program demonstrates clearly that if you provide good services for people of limited educational background and low income levels, they will usually make use of the services. It is important that they be treated respectfully, as human beings; that their problems are listened to; and that we direct our attention to trying to help them solve these problems.

There is no question, Dr. Lesser said, that the Maternity and Infant Care program illustrates that attention to specific problems related to the outcome of pregnancy produces results. This does not necessarily mean that the same kind of attention will reduce infant mortality below a rate of 18 per 1,000 live births; but it does mean that great excesses of deaths can be eliminated.

Developing a New Mixture of Services

We have enough knowledge and technical capability to reduce infant mortality substantially, agreed Nancy Amidei, a member of the professional staff of the Senate Select Committee on Nutrition and Human Needs. Our problem is not so much the need to develop new techniques and new resources as it is the need to make these available to people at greatest risk. And even though infant mortality is clearly higher in some countries than others, in some parts of each country, and in certain socioeconomic groups, there still remains an absolute risk for all groups. The fact that a woman can afford to pay for high quality care does not guarantee that she will get it.

We need to avoid the trap of planning and providing services "for poor people." Experience has shown that services provided on a categorical basis tend to be fragmented services and also that they tend, in the long run, to be poor services. The experience of county hospitals and charity hospitals demonstrates this. We should not think of maternal and child care for poor people but of optimal services for people of mixed socioeconomic levels.

In the economic sense, demand often creates supply. This is not true, however, in relation to something like health services. There has been demand--in the sense of need--for better health services for mothers and infants for a long time, but this need clearly has not been met; and it will not be met by relying on demands of the consumer group. The population at large does not have the level of awareness of knowledge necessary to bring about the kind of public pressure that would stimulate development of the personnel, facilities and resources needed to deal adequately with the problem. The responsibility will have to rest with the medical and scientific communities, who have known about the need for a very long time and have not taken adequate steps to meet it.

This is not to say consumers should not be heavily involved in the development of services. They should be, but the burden of proof should not rest on them. At the time of the Poor People's Campaign, the participants asked, as consumers, to be included in program planning, so guidelines were written to include poor people on health planning councils, regional medical councils, etc.--most of which already existed. This is fine as far as it goes, but this kind of participation really comes too late. Such participation implies: "Do not make your choices on the basis of what is optimal, but within the system we have, what you would opt for."

A related problem which has been apparent in the development of programs like the Model Cities Program is that they are less innovative than they are supposed to be, Miss Amidei said. Communities are supposed to look at what is available and say, "This is how we can use our resources more innovatively," and the Government is supposed to fill in the cracks. But what has happened is that hard-pressed communities with myriad problems have said, "We don't have time or staff to come up with a lot of fancy ideas. What is Washington buying?" And Washington says, "Well, in the past we have had this and this;" and this, then, is what the community knows it can get, instead of what it needs. And we call this community participation!

The same thing happens with medical care. We involve people at the local level, and they come up asking, "What is Washington buying?" Some of the Community Action Programs under the Office of Economic Opportunity are trying to change this. They are sending out teams of professional and paraprofessional community people with the instructions, "Look at your county, look at your State, and tell us what you need. Make your recommendations not on the basis of what we have, but on the basis of what you think we ought to have." There is to be a conference in South Carolina dealing with six of the Southern States. The community people are going to meet on a basis of equal partnership with the medical people and professional people from the Government to draw up a plan not on the strength of what is assured of getting funding but on the basis of, "If we could do it, what would you want?" This is more on the right track.

The development of adequate services will have to be a shared responsibility of many groups. We have by no means exhausted the possibilities for Federal intervention in this country, but we need to take a hard look at the experiences of other countries to see how they relate to our own experience with a very large, heterogeneous population. Many of the countries with broad national health services programs are countries with much smaller land masses, much smaller populations, and a very different type of population than the United States. We do not at present have a clear-cut answer about whether we should move toward or away from a national health service system for the United States. The kind of Federal-State system we have makes it difficult to implement an effective national program, as experience with school lunch programs has shown. It is easier to deliver hot meals to the boys in Viet Nam than to provide meals in a school in Mississippi that doesn't want them because they involve Federal aid.

In any case, we cannot afford to rely solely on the possibility that the Government will come up with a massive program to provide adequate health care for all mothers and children and thus reduce infant mortality. We can't say the private sector isn't doing it, or the AMA isn't doing it, or the National Medical Association isn't doing it so we have to fall back on the Federal Government to do it. That will get us nowhere. We need an active mix of "service providers"--Federal and non-Federal, public and private, private corporations, community groups, medical societies, pharmacists; even the guy who stocks the milk machine. We need different mixes and different systems for different parts of the country and even different areas within the same city.

We need to give more emphasis to casefinding, perhaps by paraprofessionals. Thus far, the only people who are doing much along this line are the medical students, through the Student Health Organization and the Student AMA. They are taking on an investigative role. When they see sick babies they go out into the community and into the homes to find out whether the babies are eating lead paint off the walls, or whether they have simply had no care since they left the hospital a few days after birth, or what. And then they try to see what can be done to improve the situation.

We need all of these things, Miss Amidei said-more locally based services, better casefinding, a mixture of services supplied by a mixture of providers, new categories of health personnel, a clearer role for the consumer--if we are to avoid development of categorical services that are nothing more than an extension of what we have now. Our goal is not services for poor people; what we want is good services for everyone.

Establishing Priorities

Are we really looking at the right questions, several participants asked. Our pursuit of the reduction of infant mortality as a goal in itself may be leading us astray. It is not important to chase after Sweden and try to match her rate. What is important is to concentrate the resources of the country on getting rid of the inequities of our society; only then will we fulfill our real goal.

What is the likelihood of a child born in adverse circumstances growing up into a healthy, normal individual? The risks are not limited to prenatal and immediate postnatal life. By keeping infants alive through their first 28 days or their first year, are we rendering a service to society commensurate to the effort that goes into it? We can build more and more medical centers and bring down the infant mortality rate, but medical centers and hospitals alone cannot solve the problem. Hospitals emphasize treatment, and treatment comes too late. Socioeconomic advances and preventive medicine are the only hopes for real improvement. Yet governments find themselves under political pressure to build more hospitals, because people can understand what hospitals do. They can see quick results. It is harder for them to understand the vaguer concepts of preventive medicine, especially since it takes so long before the effects can be seen. Such problems as mental retardation may be actively increased if we save the lives of infants only to return them to deprived home environments. In one county in the United States, 20 percent of all low economic level individuals have IQ's below 70.

We know that socioeconomic factors alone do not entirely explain the differential between the rates for different ethnic groups. The infant mortality rate among nonwhites is rising in one of the richest counties in the United States where the average level of education and income of nonwhites is also rising. It appears that the problem increases as the society becomes more complicated, even if the educational and income level improve. Yet there can be no doubt that there is an established relationship between poverty and infant mortality. It is part of the fabric of the life of the ghetto. Whether we break it down in terms of black, white, Mexican-American, Indian and Puerto Rican is not important; what is important is that we cannot maintain people in conditions of poverty and discrimination and still reduce infant mortality appreciably, even if we provide excellent medical care.

Thus our objective must be not so much the reduction of infant mortality but the creation of conditions that will assure that every child is wellborn and will be reared in conditions of normal growth and development that will enable him to fulfill his genetic potential. In this country we are making a start through Maternity and Infant Care programs and other programs geared to provide continuous care for children and youth up through the ages of 18 or 21, but the question is how we can engineer our approach to the problem so as to break down institutional barriers and bring together the personnel and facilities necessary to make such programs available in every community.

If we could pull the infant mortality rate in 90% of the counties of the United States down to 18.3, we could save 170,000 lives over a five year period. We do not need additional knowledge to do this. We have enough knowledge to do it _if_--and here is the important intervening variable--_if_ we bring about institutional change, including programs of comprehensive care, that will change the whole socioeconomic fabric of life for the people of the ghetto. Only at this point will we be able to determine clearly how much infant mortality is modifiable and how much, tragically, is not modifiable and must simply be accepted. A principal focus of our efforts in the coming decade would be to try to identify exactly which biological, physiological, genetic, medical, social, cultural and economic factors are the most important and which can be successfully manipulated to bring about reductions in infant mortality and morbidity.

One way to identify the direct effects of good medical care would be to study what happens to women from poverty backgrounds in underdeveloped countries who emigrate to a country like Sweden or Germany where the standard of medical care is high. Do their chances of producing healthy babies increase or do the effects of their former environments carry over? If these women do, in fact, receive good medical care, the infant mortality and morbidity rate among them will drop as has been demonstrated in Israel which absorbs immigrants from deprived backgrounds from many countries. On the other hand, if they simply move from the ghetto of one country to the ghetto of another and continue to live in poverty and without good medical care, it is probable that the rate among them will not decrease.

It is also evident that we often fail to get services to the people who need them. One of the problems that concerns him as a medical student, a participant said, is whether many of the new health care programs are based too much on the established system, which is simply accepted as the best available system. Are the programs keyed in closely enough with the wishes of the consumer? Can they fit into the scheme of life of people who have not had this kind of care before? Are we, as physicians, forcing our system down their throats? The distance between doctor and patient bred into medical students by the medical profession really precludes a thorough evaluation of the consumer's duties. On the other hand, the consumer himself sometimes perpetuates old systems by his vision of optimal medical care as the kind upper and middle class people now get in hospitals. The consumer may feel he is getting the best care only if the doctor is available to answer all his questions, even if he might get better information from paramedical people with expertise in such fields as nutrition and family planning.

Consumers have been brought into the planning and development of some services, replied Children's Bureau Research Director Charles Gershenson. In New Haven, for example, consumers were brought in from the very beginning in the development of comprehensive health services for children and youth. They were involved in developing the request for funding, selecting the site, developing the program, approving or vetoing the medical director and other staff, determining the hours and terms of eligibility. They even decided the space use and decor, setting aside a separate reception room, complete with red carpet, for adolescents so they wouldn't have to wait with the younger children. It is too soon to say whether all this does, in fact, result in families getting better medical care. Truth to say, not all projects follow this model, but there is a trend away from thinking of people as patients or clients toward thinking of them as consumers.

This can backfire. Too much consumer control can result in lowering of standards of care, with resulting effects on prematurity, birthweight, and infant mortality. Some of the black militant groups are very insistent about controlling the health care system. They say that if people think a granny midwife or a witch doctor is what is needed, that's what they will use; and they will not listen to any talk about the need to maintain medical standards.

Perhaps we are misinterpreting the meaning of such protests, other participants said. On the basis of our own sense of values we have made an a priori judgment that reduction of infant mortality is a significant social goal. Perhaps the militant, protesting consumer is trying to say, "We have other goals which are more critical, like enough to eat, and better housing. Infant mortality is a subject of lesser importance, and we will deal with it in the way our people will accept until the more critical problems have been dealt with."

When you work in an area where everyone either has had a baby who died or knows someone whose baby has died, you get a different perspective on motivation. This is true in places like West Africa, where a high percentage of people live in rural areas where mortality rates are high, and it is true in the migrant and inner city areas of the United States. Because, in their experience, it is in the normal course of events for babies to die, it doesn't occur to the mothers to go to a doctor when their babies seem sick. It isn't so much that they lack motivation to take care of their children as it is that they have become inured to the idea that this is simply what happens; babies die.

Perhaps what we interpret as neglect or indifference toward the welfare of progeny in individuals whose principal concern is survival is really a reordering of priorities. Perhaps their neglect is a natural expression of self-protection. As a result they may be unconcerned or even hostile toward propositions that will reduce perinatal mortality.

If so, other participants responded, the community has a responsibility to help such people redefine their goals and responsibilities toward themselves, their families, and the larger community. All of us, in our respective roles, have a lot to learn about how to work effectively with the consumer of health care services. One of the most critical elements is the attitude of the staff and the community in respecting the consumer's ideas and cultural patterns and treating him with dignity as an individual human being.

Sometimes a witch doctor can be very useful, said Dr. Jolly. In Nigeria, traditional native medicine is being harnessed with modern Western medicine in a very rational way. Nigeria's first trained psychiatrist was involved in building a psychiatric hospital. In Nigeria, people tend to be very frightened of the mentally ill. They are considered a danger to the community and are often chained to the wall in a building along side the prison so that the warden can look after both. Consequently, patients with mental disorders began arriving from all over the country before the building was completed, and it was a great problem to know what to do with them. The solution was for them to be housed in a number of neighboring villages, an arrangement which proved so successful that it was continued for some patients after completion of the hospital building. Such patients attend the hospital on a day-care basis.

In each village the witch doctor--or native healer, as they are now called--is also utilized as a part time consultant working with the psychiatrist. Sometimes, the witch doctor comes to the psychiatrist and says, "Look, I know this chap very well. He would be much better if we could sacrifice a cock at the next full moon." Depending on the situation, the psychiatrist may say, "No, this patient is responding well to psychiatric treatment," or he may say, "OK, go ahead; it might help." The patient gets the benefit of modern medical practice and the support of his cultural tradition, and he gets better.

Failure to make use of services does not always indicate resistance to them, another participant said. Sometimes it is a question of how rapidly consumers can assimilate new ways of doing things. In his own experience in community health, he said, he has discovered that the goals of the program cannot be achieved overnight, even though the people want good services. The problem is that the level of their acceptance is limited by their educational level, the customs of their culture, and their general life experience. Even when we walk in with quality care that the people are eager to have, it takes time to build the kind of acceptance and use that will enable us to do the job as we would like it to be done.

We have to move beyond the stage of assuming that the individual is at fault in the high infant mortality rates in this country. Beautifully written research proposals come in for studies of lack of motivation--why women do not use prenatal and health care services. But when you look into the question you discover that the reason they don't use the services is not apathy, anomie, or lack of motivation; the reason is that there are no real services available to them. Sure, services are available if they can find a way to travel miles and miles to sit for hours and hours in clinics where they will be treated in the most demeaning and discriminatory manner. Whenever really good services are set up that meet people's needs, more people come to use them than can be accommodated.

What lack of motivation there is about the use of services is often in the medical and social work professions rather than in the mothers, a pediatrician said. The ideas of reorganizing services to provide better care gets to be a naughty word. The professional groups call such ideas socialized medicine and fight them tooth and nail. The medical profession talks about not having enough physicians to go around, yet the profession itself plays a big role in perpetuating the demand for the family physician. We are functioning on outdated systems because we have neither clarified our priorities nor given them the force of social policy.

HEALTH CARE FACTORS IN INFANT MORTALITY

In discussing the health care factors affecting infant mortality, the participants explored the role of various disciplines and the changing goals of each. It is not enough, they said, to provide care that will keep babies alive. They must be alive and well. This means that there must be excellent obstetrical and nursing care and thorough prenatal and postnatal diagnostic treatment. This can be achieved only through more effective training and use of health manpower and the development of really practical systems of health care. So little is known about neonates that the line between research and care is often a fine one, but we do know many of the things we need to do to assure intact survival. What we need to do now is to apply what we know.

Fetal Excellence: The New Goal of Obstetrics

The goals of obstetricians are changing, said Dr. Karlis Adamsons, Associate Professor of Obstetrics and Gynecology, College of Physicians and Surgeons of Columbia University. Initially the obstetrician was concerned primarily with the survival of the mother. Once this goal was achieved, he became concerned with the survival of the child. But survival is not enough, and the new goal of the obstetrician is neonatal excellence.

The total number of babies lost in this country from inadequate care is probably not very significant from a national viewpoint. But physicians know that between the child who dies from causes known or unknown and the child who survives and is well, there is a large population of impaired infants who will become burdens to society if they live. It is this group that particularly deserves our attention. We should learn what needs to be done to avoid creation of an individual who cannot express the genetic potential with which he is endowed, and should commit ourselves to guaranteeing that each child will be in optimal condition at the time of birth. To achieve this it is not enough to provide better intrapartum care; it is essential that we learn more about assessing fetal circumstances throughout the entire period of gestation. Assessment in early pregnancy has a different objective than that during late pregnancy. In the early stages the objective may not be to preserve the fetus but to interrupt the pregnancy when there is clear evidence of irreparable fetal damage. Cytogenetic studies of cells from the amnion and chorion, and studies which identify enzyme deficiencies incompatible with normal survival have been successfully performed as early as eight to ten weeks after the beginning of pregnancy. In the Scandinavian countries, particularly, pregnancies have been interrupted when the fetus has been identified as a carrier of progressive muscular dystrophy, hemophilia, or other serious disorders. The mother is then allowed to conceive again, and she ends up with a baby who can become a self-sustaining and intact human being instead of one who is severely handicapped.

Perhaps we need to identify the categories of people in our population who are best suited for procreation, and those in whom procreation is undesirable. This is a subject to which we are reluctant to address ourselves, but if our goal is optimal newborn health and child health, we cannot evade this issue. It is unrealistic to refuse to recognize that mothers at the age of 45 are apt to produce more than a fair share of children with handicaps, or that the rate of complications of pregnancy which produce impaired infants is high even among mothers of 30 or 35. Perhaps it is the obligation of the obstetrician to deemphasize the procreative processes in high risk populations rather than to encourage them when he has clear knowledge that he has no therapy to offer that will change the statistical probability of adverse outcome.

Much of the work that has been done in evaluating fetal maturity and normality has been done too late in pregnancy to permit therapeutic interruption. Consequently, the possibilities of modifying fetal maturation are being explored in the hope of producing infants who will be better able to cope with such problems as hyaline membrane disease even if they are born before normal term. It may even be possible to decrease the energy requirements of the maturing central nervous system of the fetus to allow him to remain in utero longer so that his vital organ systems can mature. This would be important for a child whose mother has limited transfer capacity across the placenta because of hypertensive cardiovascular disease.

One area in which we already have tangible evidence of success is in monitoring of the fetal blood during labor and delivery. The intrapartum period, lasting about six hours, is probably by far the most critical period in human life. Until five or six years ago, contact with the fetus was unscientific and limited largely to the intermittent recording of the heartbeat and observing for signs of meconium in the amniotic fluid. These are not very satisfactory indicators of fetal well-being. Direct sampling of the fetal blood has made it possible to assess a variety of indicators and a great deal has been learned about fetal behavior and fetal response to the processes of labor. Some progress is also being made in continuous recording of fetal heartbeat, although this is handicapped by lack of reliable instrumentation and by lack of knowledge about the relationship between fetal well-being and changes in his cardiovascular performance. Subhuman primate research on this topic has been quite rewarding, however, and has made it possible to generate information prospectively which cannot be obtained retrospectively from clinical studies. This is an area of research still in process of rapid exploration, but a large amount of success can legitimately be anticipated. In this context, "success" implies a reduction in fetal mortality and the delivery of a higher proportion of infants in optimal condition.

We need to set priorities in relation to the kinds of observation and research that will lead most directly to improved care. For example, a great deal of time may be spent monitoring a patient with advanced atherosclerotic disease, although it is unlikely, with our present skills and techniques, that the outcome of the pregnancy can be altered. On the other hand, cases in which the mother is diabetic or shows evidence of preeclampsia may well benefit by agressive medical attention and better understanding of the underlying disease processes.

There is some danger, Dr. Adamsons suggested, that we will create unreasonable expectations in people about health care services. Before we tell the population all about the kinds of facilities they should have, we'd better be sure such facilities are available. What effect does it have on a mother and her unborn child if we tell the patient she needs more and better care and she finds herself frustrated in obtaining it? She is told where good care is available, and she goes there in good faith, only to be subjected to long waiting periods or turned away completely from the institution where supposedly optimal care is available. Studies of subhuman primates have shown that frustration and emotional upset in the mother are disturbing to the fetus and cause reduction of oxygenation. When the mother is soothed and protected from disturbing phenomena, the condition of the fetus improves. It is hard to say whether the human fetus may be similarly affected by the mother's frustration at being unable to obtain good care, but the medical profession should concern itself with such possibilities.

The excellence of pediatricians has in some ways retarded the chances of obstetricians becoming really competent in the management of neonates. The pediatrician has given the obstetrician the impression that if he is given a baby that has a heartbeat after cardiac massage, he can take over from there and everything will be fine. If you talk to obstetricians, it is staggering to discover how little they know about the neonate and how heavily they rely on the pediatrician to know about acid base, resuscitation, positive pressure, ventilation and a host of other things.

We really should reverse this trend. Pediatricians should say to obstetricians, "See to it that you don't give me an asphyxiated baby or one with brain swelling or some other avoidable problem, because if you do, I can't save it; or if I do, the damage will be beyond repair." We cannot entirely eliminate damage due to chromosomal and metabolic defects, but we can put a stop to problems that are the result of poor procedure. Neonatal death conferences that center around babies who have died because of severe, unavoidable malformations are not very useful. The focus should be on perinatal conferences about "low score" babies who survive with handicaps. The obstetrician should have to justify why this occurred. Was there unrecognized hypertension? Too much analgesia? Was the fetus asphyxiated for too long? What could have been done during labor to prevent the handicapping and assure the birth of a whole, healthy child?

In summary, Dr. Adamsons said, many changes have taken place in the attitude of the obstetrician toward his obligation. He recognizes fetal excellence as his prime objective. He is aware that he can substantially improve his service to his patients by better organization and distribution of his time. And he is aware that he needs a great deal of additional knowledge about the prenatal patient and that such knowledge may enable him to move well beyond the present quality of management and care.

Prenatal and Postnatal Diagnosis and Treatment

There are many ways we can reduce infant mortality and morbidity through better prenatal and immediate postnatal diagnosis and treatment, said Dr. Billy Andrews, Director of Newborn Services, University of Louisville School of Medicine. During the past decade there have been numerous advances. Many of the techniques and types of equipment which have proved so successful in coronary and postoperative units have been adapted and scaled down for use with the newborn. Laboratory methodology has been improved to a point where a baby can be assessed with micro and ultramicro techniques almost anywhere in the United States. Increased understanding of neonatal physiology and pharmacology has led to greater clinical acumen. Special therepeutic procedures have been developed.

In most centers, the reduction of infant mortality is attributed to the immediate attention that is given to ventilation, circulation, acid base, metabolism, nutrition, and temperature control during the first few minutes of life. This requires constant attention. In the intensive care unit in Louisville, Dr. Andrews said, the babies are never left alone. The medical team "lives right on top of them." If they are not breathing, he said, "we breathe for them." The mortality rate for the first 28 days of life has dropped from 27.1 per 1,000 live births to 16.0.

Prematurity is the leading cause of death in the neonatal period. During the past year, it was a factor in 94.4 percent of the total neonatal mortality in this hospital. The problems of low birthweight infants therefore need to be the central focus of attention.

Prematurity has many causes. It is important, first of all, to identify the mothers who are most apt to have premature babies and provide the necessary prenatal treatment of the fetus and the mother. This is, of course, a major focus of the Maternity and Infant Care program begun by the Children's Bureau. Many of the classically described high risk pregnancies will always be with us, such as those in which the mother is diabetic, anemic, or has a viral disease. Multiparity always creates certain problems, and pregnancies before the age of 16 or after 40 inevitably carry certain risks.

Rh sensitizations are becoming less of a problem because amniotic study makes it possible to know when the babies are getting into trouble so that they can be treated at birth. In addition, the hazard of Rh complications in later pregnancies can be reduced by preventing sensitivization of the Rh negative mother through administration of Rh antibody after delivery of an Rh positive infant. Mortality due to hydrops fetalis has dropped sharply since 1965. With many of the problems of pregnancy, excellent care which takes into account the many influences on maternal environment and heredity can do much to assure a favorable outcome. Every mother should be closely watched for early indications of toxemia.

Top quality care should be equally available to mothers and infants in the hospital and outside of it. Most medical orientation in the past has centered around hospital care. We need to create more centers in areas readily available to the people. These should include a broad spectrum of diagnostic and specialist consultation, home nursing, nutritional consultation, dental and other care. Transportation should be provided, especially from rural areas to the centers.

As with many other problems facing modern medicine, the major factor which will lead to a reduction of mortality is procurement of a well-trained, cooperative team of medical, nursing and paramedical personnel. Pediatric consultation should not be delayed until the moment of birth. Potential problems should be identified well before the baby's birth, and the pediatrician should be in the labor room and the delivery room. Manpower shortages make this goal difficult to achieve, but it is tremendously important.

We need more research into the etiology and treatment of the problems of pregnancy already mentioned and also into the whole area of human reproduction; the physiology and biochemistry of the embryo, fetus and newborn; the changes in maternal physiology and biochemistry during gestation and labor. We need better understanding of the problems of the central nervous system; cardiorespiratory problems; hematologic disorders of the newborn; structural organ maturity; temperature control; inhibition of the enzyme systems; and the specific problems of hypoglycemia, hypocalcemia, hyperbilirubinemia and acidosis. We need to learn more about how to diagnose and treat mycotic, parasitic, viral and bacterial infections. We need to give more attention to congenital handicaps related to chromosomal defects or environmental defects in the uterine environment. We must be able to determine whether a baby is constitutionally normal or will be stunted in some way by dysmaturity or placental insufficiency prior to birth.

We need to ensure that there will be adequate pelvic outlet at the time of birth so that a difficult and damaging forceps extraction can be avoided. Elective caesarian section should be avoided whenever there is a doubt about fetal size and age. Hyaline membrane disease is present in a very high percentage of infant autopsies, but this disease can often be avoided by giving the baby an additional one to three weeks in utero. Conservative management of placenta previa prior to the last month of pregnancy can also give the baby that crucial extra day or week or month. It is equally important to avoid allowing babies to become severely postmature. Determination of steroids in maternal urine and blood now make it possible to determine when it is necessary to deliver a baby to avoid problems of post-maturity or placental dysfunction.

Use of analgesia and anesthetics should be minimal, especially with premature infants. Oxygen, blood, drugs and fluids should be readily available but should be used with care. In order to reduce retrolental fibroplasia, oxygen should be used only for cyanosis and, with higher oxygen concentration, with monitoring of arterial oxygen tensions. Prophylaxis against gonorrhea of the eyes is required by law in many states, and so are tests for certain metabolic disorders. The cord should be observed when it is tied. To control infections, a bacteriostatic agent should be applied to the body and the babies should be washed frequently with such an agent. The use of antibiotics and other drugs, however, should be kept to a minimum and there should be definite indications prior to use. For infants with asphyxia or respiratory distress, antibiotics should be used only after cultures have been taken. Digitalis, diuretics, and adrenalin should be used sparingly. Steroids are used occasionally. There is only a very small pharmacopeia now which is useful for babies.

In Louisville, Dr. Andrews said, one of the largest areas of reduction of infant mortality has been among the very tiny babies, under 1,000 grans birthweight. This carries an obligation with it. We have merely touched the top of the iceberg of the research we need to do on the specific problems and methods of care of the newborn. We can save babies; this has been demonstrated in almost every major medical center in the world.

Now, the problem is to assure intact survival. This is where the greatest challenge and obligation lies.

Neonatal Research and Care

Whether we are talking about the health care system as a whole or the actual practice of medicine, said Dr. Louis Gluck of the Department of Pediatrics of the University of California School of Medicine at La Jolla, we are doing a terrible job in this country. We aren't even providing enough beds for patients, but we go on blithely talking as if we were providing adequate care to patients and ignoring the fact that we are not. We talk about the impact of socioeconomic problems and ignore the fact that patients very often receive different levels of care not for socioeconomic reasons but simply because of the color of their faces. Studies in several hospitals have shown, for example, that Negro babies are played with and handled by the nurses much less than white babies.

We carry over outmoded and destructive medical practices. For years it has been traditional not to feed premature infants for 72 hours on the theory that they will aspirate too much fluid and die. Yet many low birthweight babies have extremely low blood sugar levels at birth. How much irreparable brain damage is done by depriving such children of nourishment at the very time they need it most?

There is often a very narrow time span--a brief critical period in life--which determines whether the child will be a healthy individual or a damaged one, particularly if he is a high risk individual. For example, some low birthweight babies are as capable of extrauterine adaptation as any normal full-term infant. If they were deposited in the nearest field it would make no difference, as long as someone were present to feed them. But other babies are entirely different metabolically. They require fluids, sugar; they have to be kept warm or they cannot adapt. Medical practices must be good enough to protect the weak babies as well as the strong ones, and very often they are not.

There are also hazards in the old concept of "Don't just stand there; do something." For years the idea prevailed that it was beneficial to turn up the oxygen fully in incubators. No one knows how much brain damage and blindness was caused before this practice was abandoned. Children were put on high levels of sulfa or chloromycetin with inadequate attention to the consequences. As a result there were numerous deaths in the 1950's and 60's. This is bad medical practice, and inexcusable. Biologists had understood for decades the implications of immaturity and development, especially in relation to drugs. From experiments they could easily extrapolate that the developing human is a delicate organism that has to be handled with respect, but physicians were too eager to do something--anything at all--to exercise proper precautions.

There is a tremendous gap between the great amount that we know and what we are doing to put the knowledge into effect. We are not giving adequate attention to problems of the perinatal period. There is a national agency for almost anything you can name, but there is no National Perinatal Foundation. There is no National Perinatal Center, nor even a National Institutes of Health intramural program in perinatal research. This is a pressing need, but nothing is being done on a nation-wide scale to focus in on the problems of the newborn.

We know that the whole first year of life is a critical period, yet the Federally supported Maternal and Infant Care program does not train personnel to go into homes for followup care after the baby goes home. This has been discussed but never authorized nor funded. So we struggle along in the same old ways. Public health nurses do the best they can, but they work in a system of care predicated 30 years ago when conditions were very different, and no provision is made for them to go back to update their training and find out what is going on today. There is a great deal of general awareness of health care needs, but the translation of awareness into action is a slow process. The pediatric profession is trying particularly hard to define its role and the ways it needs to become more heavily involved in community health programs.

We must regard the delivery of community health services as a major social endeavor which requires a great diversity of talent, Dr. Gluck continued. Within this framework, there is a need for better utilization of the medical schools in the delivery of care. Because of the large amount of Federal support they receive, they are in part a logical extension of Government effort which can reach directly into the community. The money is there, and the people are there; the problem is creating public awareness of the potential services. By assuming responsibility for satellite community hospitals about them even at some distance, as well as for their affiliated hospitals, the medical schools could bring about, very quickly and effectively, the kind of regional medical care that is needed.

There have been some attempts in this direction in coronary care. But what about the other end of the population spectrum, the mothers and infants? The medical schools have both short-term and long-term responsibilities. They have short-term responsibility for medical care of mothers and children, and they have long-term responsibility for basic research. In this, they share a partnership with the Federal agencies from whom so much of their financial support comes. In the neonatal age group, the line between research and patient care is a very fine one. We know so little about the neonate that much of his regimen has to be on an experimental control basis--this versus that. This is research, but it is also patient care.

What is most needed is research on biochemical development of the fetus, organogenesis, the amniotic fluid and what it tells us about gestation, changes in the mother's blood that give clues to what happens at each stage of development, perinatal enzymatic screening tests. Tests of this kind can be done on a limited basis with cells extracted from the amniotic fluid. We also need techniques for fetal biopsies to permit us to grow large sheets of cells from multiple studies.

We need to do an immense amount of research on the crucial last eight weeks before birth and first four weeks after birth. This is when the majority of deaths occur. We need to know a great deal more about placental physiology and about the mysteries of extrauterine adaptation, particularly pulmonary adaptation.

One of the major aspects of development about which we know least is the nutritional developmental capabilities of the individual. With the formulas we are using are we, in fact, producing earlier and earlier atherosclerosis in our population? We may be. We may or may not be feeding properly; the truth is we really don't know.

We also need to discover what we can do to reduce neonatal mortality and promote healthy development through better clinical management. We need to standardize instrumentation that we use with infants. We entrust all of our infants to a limited number of machines put out by a limited number of companies without any significant attempts to regulate their quality. We know that there have been instances of electrocution of patients because physicians have not known that a great drop in electrical potential existed across the patient. We have no guidelines, no toxicology for instrumentation of infants, although this is desperately needed.

In yet another area, we need to experiment further with better systems of care for high risk infants. During the 1950's efforts to control infection in nurseries led to some very rigid legislation concerning nursery construction and practice. Only certain specific ways of handling infants were permitted, but the recommendations were based on an absolute dearth of experimental data. For example, it was widely assumed that certain types of infections, notably staphylococcal, are airborne which are, in fact, spread almost entirely by direct contact. Studies showed that a baby may become a culture medium and be handled by a nurse who fails to wash her hands adequately, and the bacteria may be passed on to the next baby she touches. Airborne infections account for only about two to three percent of the infections one finds in the nursery. With this point clarified, it became possible to lay aside certain rigidities of technique which were in no way helpful and start looking for better ways of caring for infants.

Past recommendations and legislation designed to improve infant care were well meant; they were developed by honorable men genuinely concerned for the well-being of infants. But their net result has been to fragment care. In the usual hospital, for example, the newborn unit becomes a kind of isolation ward completely separate from the rest of pediatric care. This reaches such an extreme that only infants born on the same day can be housed in the same unit. If an infant becomes ill, he is put into isolation. The nursery nurse can no longer care for him, and the obstetrical floor nurse becomes responsible for him. He ends up with considerably less than adequate care at the very time he needs it most. Infants, post-operatively, often are put in adult recovery rooms where they cannot get the specialized care they need. There are separate premature nurseries, there are isolation areas for infants admitted from the outside, there are "suspect" nurseries, there are isolation rooms for inborn babies, and even pediatric wards have isolation rooms for newborns.

Hospitals can afford this kind of fragmentation only if they have sufficient numbers of personnel adequately trained to take care of infants in these different situations and locations and assure a consistent and a good level of medical practice throughout. But the pure and simple fact is, hospitals do not have these kinds of personnel and they have no prospect of getting them. Nurses are the key personnel in the entire scheme, and the number of nurses is falling further and further behind the number needed.

With the consent of the Connecticut Department of Health, the Memorial Unit of the Yale - New Haven Hospital undertook experiments to learn how to mix infants with different types of problems together. At the same time, extensive surveillance of infection was begun to determine whether the infants were a hazard to each other. The studies were begun in 1959 and were completed in January 1962. The newborn special unit brought together full-term and immature infants, outborn and inborn, healthy babies and those with medical, diagnostic and surgical problems. Occasionally, even babies up to toddler age were admitted without any particular management problems developing.

In the beginning an antiquated nine bed premature infant unit was used; then this was expanded by an adjacent ward to form a 24 bed unit. In 1964, a half million dollar gift made it possible to plan a new unit. The total bed capacity is 40 infants, including one large experimental area that can handle as many as 20 infants. The large open space plan is preferable to small enclosed cubicles because it makes possible more efficient use of personnel. All of the babies are in full view, and the cribs can be moved easily to provide as much space as is needed. Within the unit, many problem infants can be managed simultaneously; for example, one infant may be receiving ventilatory assistance from a respirator, another may be on constant intravenous perfusion for "short gut" syndrome, many premature infants may be there, and another infant may be treated intravenously for infection while post surgical infants also receive care.

The unit was designed without windows, but lighting is at daylight level. The unit is conveniently located in relation to the delivery and postpartum rooms and the elevators. The core of the unit is the nursing station. Ancillary facilities include a laboratory, treatment units, rooms for minor surgery, sleeping rooms for house staff, nurses' lounge social service unit, and rooms in which parents can be taught how to care for their babies. The plans include space for a research and computer data acquisition center as part of the unit.

In order to keep the physical arrangement as flexible as possible, all outlets for oxygen, compressed air, suction, electricity, etc., are in the ceiling. Each nursery is self-contained with a modular storage wall containing everything that is needed so that no piece of regular emergency equipment that might be needed is more than half the nursery distant from any bed.

The treatment room also used modular arrangements in storage walls containing equipment for minor surgery, exchange transfusions, etc. An x-ray unit was designed which gives threefold magnification, making it possible to see the chest of an infant in much greater detail.

This unit makes it possible to provide the best techniques of intensive care. Its goal is to provide optimal observation and care in order to reduce morbidity as well as mortality. All pediatric nurses are rotated through this unit, with the result that a large body of well-trained personnel has been developed. Human contact is specifically encouraged. If the nurses have nothing else to do, they are expected to pick up and cuddle a baby. Rocking chairs are used when the babies are fed, and parents are encouraged to participate in the care of their babies.

To keep costs of creating a unit of this kind at a reasonable level, it is important that exact requirements be well thought out in advance. What often makes architectural fees soar is that physicians and others in charge of the infants have not defined clearly enough in their own minds what features they want included. If they cannot communicate what they want to the architect, he cannot plan a unit sensibly; and the result will be many expensive false starts and revisions.

Self-evaluation is an important part of any project of this kind. Everyone has the impression that intensive care units are very successful, but, in fact, no controlled studies have been done to substantiate this impression. If we are to judge just how effective a particular unit is, and what improvements or changes are needed, there must be continual evaluation of several kinds. Information about all infants should be recorded on IBM cards for easy retrieval. This should include such information as whether the child received resuscitation at birth, and if so, if this was necessary because of infection, cardiac condition, drug effects, or unknown causes.

Evaluation should include an extensive continuing infection surveillance program. It is essential to know whether there are trends or changes in trends or whether there are new bacteria that shouldn't be there, or old ones that might become dangerous.

Perinatal conferences should be held at regular intervals to examine mortality and morbidity information on every infant and determine what could have been done better. It should include obstetrical procedures, anesthesias, surgery, pathology, nursing and pediatric care.

These, then, are some of the basic considerations in developing neonatal care units, Dr. Gluck concluded. Much remains to be learned, but we do now know at least some of the procedures and environmental factors which can contribute to better and safer neonatal care. We have two kinds of goals, long-term and short-term. The immediate goal ought to be to apply what we know so that we will stop adding to the pool of damage and dead children. It will do us little good to talk about socioeconomic problems or whether we should give priority to infant mortality or the well child. The central issue that cuts through all of this is that inadequate medical practices still exist in many areas, and until we attack this problem through more penetrating research, better training, better health care facilities, and higher standards of care, much of the rest will not be meaningful.

Nursing Care of the Newborn

Many of the problems of nursing care of the newborn are the same ones we have faced throughout this century, said Dr. Eileen G. Hasselmeyer, Goodrich Professor at the Yale University School of Nursing. We must still cope with problems of care like controlling infections and supplying proper food and warmth; there are also the problems of recruiting and training adequate personnel.

Nursing practice and techniques have changed from time to time, but the purpose of nursing over the years has remained the same. Systematic studies and direct evaluation of the contributions of nursing to maternal and infant well-being are sparse in the literature, and the role and contribution of nursing need to be defined more clearly.

Nursing needs to look much more closely at the effects of nursing practice on patient welfare than it has done to date. Nursing is still too much grounded in traditional, old guard approaches.

Premature nursing as a nursing specialty in the United States began about 1922, under the pioneer efforts of Miss Evelyn Lundeen at Michael Reese Hospital in Chicago, Illinois. The routines established were extremely rigid, but in keeping with the times. The nurses wore caps, gowns, and masks and fed the babies with medicine droppers. The infants were handled as little as possible, and the nursery had a strict "no admittance" policy. A public health nurse was part of the staff. She worked with the babies and knew them individually; she also went into the community to evaluate the home situation and work with the parents. This appeared to work very well; It is a pity the practice hasn't been more widely continued, Dr. Hasselmeyer said. Its merits and shortcomings in relation to infant well-being should be evaluated today.

In considering the role of nursing in the care of the high-risk newborn, it is interesting to note that in 1904, at the Louisiana Purchase Exposition in St. Louis, prematurely born infants were displayed to the public in the Baby Incubator Building. The exhibit showed the latest methods of care and equipment. The building was of the most modern design and had electricity in it. Air for the incubators was circulated by a ceiling fan. There was one problem: the electricity went off at midnight. A thermal unit in the incubators used a salt and hot water solution as a supplementary source of heat.

The building was staffed with graduate professional nurses, at a ratio of one nurse for every three babies, which is better than the one-to-five ratio that is talked about today. These nurses worked only eight hours per day, instead of 12 hours as they did in other hospitals. In comparison with other hospitals, this "incubator building" had a very good survival rate, although the total well-being of the infants may be another question.

By the mid-1940's there had been some advances, but there were still many problems. For one thing, incubator design was such that it created problems in administering nursing care to the infants. For example, the lid of one incubator raised vertically from the bottom; it was not unusual for the lid to fall on the nurse's head as she tended to the baby. Frequently the units either overheated or didn't heat at all; the end result was either hyperthermia or hypothermia for the babies. In another type incubator, in order to prevent heat and oxygen loss, the nurses worked with the lid partially closed and resting on the nurse's arm. This, in turn, inhibited free movement of the nurse's hands within the incubator and no doubt affected the manner in which nursing care was given.

Some of the nursing procedures had become rather ridiculous gestures. In many premature units, two gowns always hung at each baby's bedside unit. One was the doctor's gown, and the other was the nurse's. They had to be there. Theoretically they were to be changed every 24 hours; for one reason or another, however, they might stay there for a week at a time and drop on the floor ten times, but the doctors and nurses still wore them. Standards are considerably better now. At Yale New Haven Hospital Newborn Special Care Unit, a gown is worn once and discarded.

As late as 1960, hospitals were still following the practice of minimal handling of premature infants, mainly because that is the way it had been done since 1922. It was also felt that this would prevent infection and make the babies gain weight more rapidly because their energy would be conserved. In late 1961, Dr. Hasselmeyer said, she challenged the nursing practice of minimal handling. She designed a study to test the infancy kinesthetic need theory through an investigation concerned with the effects of handling on the infant's well-being. The field phase of the project was carried out in four hospitals in New York City during a four-month period in 1962.

Sixty premature infants in a specified age and weight range were studied for fourteen days each. Half of the babies got "high handling"; half got "low handling." The low handling babies averaged 95 minutes of direct contact with another human being in 24 hours. The high handling babies were handled about three times as much as the low handling babies; they go almost five hours of handling in a 24-hour period. To increase sensory inputs, the babies were rocked and cuddled, their hair was combed, and their faces and arms stroked. Nurses and physicians in contact with the babies punched time clocks to verify the amount of handling each baby received. There was no difference in the number of infections among the high and low handled babies, and no baby had to be discontinued from the study because of a major infection. The low handling babies, however, were found to have more problems with the eyes, conjunctivitis, stuffy or runny nose and reddened umbilicus.

At the beginning of the study, the high handling babies had a lower mean weight. The weight gains were not of a statistically significant level, but at the end of the two weeks the high handling babies had overtaken the weight curve of the low handling babies. Sleep, crying, bodily activity and feeding behaviors and defecation patterns were also compared; and stress and frustration hypotheses were explored.

The study showed, first of all, that it is not handling in itself that causes infection, but breaks in technique. The study also showed that an increased amount of handling is not in itself detrimental to these patients. These findings have led to some relaxation in the old barriers against handling and to a freer attitude about letting people into the nursery.

For nursing, there are many bottlenecks to be overcome. Nurses tend to act as if the infants are their babies, not the parents' babies. Nurses also need to be encouraged to cooperate and collaborate more closely with other disciplines. There should be a better team approach under high quality supervision. Attention needs to be given to classifying the needs of normal and high-risk infants on a quality factor rather than a static nurse-patient ratio. We need to evaluate the effects of specific nursing procedures on physiological functioning and in relation to how well they meet the needs of the parents and the babies.

A perinatal nursing service in which personnel are more mobile between the delivery room and the nursery would probably enhance continuity of care and meet the patient's needs more adequately. At present, we have obstetrical nursing and pediatric nursing. A break in continuity of care frequently occurs for the high-risk baby about the time when the cord is cut; he is then sent out of the delivery room and the pediatric nurse assumes responsibility for his care. The obstetrical nurse is usually not well grounded scientifically in problems of extrauterine adaptation which have their nasceny in utero, and the pediatric nurse often lacks understanding of the processes of fetal growth and development and maternal and fetal influences upon subsequent neonatal well-being. Consideration should be given to the need for a perinatal nursing specialty which would include the total span of care. We should offer, at the graduate level, education that will equip the nurse to understand the processes and the problems the baby has to cope with in transition from intrauterine life through the birth process to his adjustment during the early days of life. The curriculum should provide a sound scientific base in various aspects of perinatal biology. It should also emphasize a philosophy of nursing service which stresses an individualized approach to the care of mothers and infants and an understanding of the needs and rights of the infants and their parents.

Recruiting the desirable caliber of people for perinatal nursing is difficult. For one thing, nursing administrators sometimes tend to use the nurseries as dumping grounds for people with physical, emotional or interpersonal relationship problems to get them "out of sight, out of mind." Such people create more havoc in the nurseries than they do good.

Recruitment is also handicapped by a misconception that obstetrical or neonatal care is a dull, unchallenging, dissatisfactory type of nursing duty. During their basic training, nursing students spend only a day or two in the premature or newborn special care nursery. This is just long enough for them to see a lot of frightening things, but not long enough for them to realize the tremendous satisfactions and challenges for nurses that lie in making a constructive contribution to infant well-being.

Health Manpower

There were two distinct schools of thought among the conference participants on questions relating to health manpower. Some participants felt that we have ample manpower available but are using it poorly, both in terms of skills and in terms of distribution. Others felt that the actual numbers of personnel available are inadequate and will be still more so as the population continues to expand. Both groups agreed that many tasks which contribute significantly to the well-being of the patient are being performed by the wrong people. There is, they said, a need to realign responsibilities and to train both professional and paraprofessional personnel to provide care in new and more efficient ways.

One of the problems in manpower utilization in the United States is prejudice against using certain types of manpower fully. For example, of the 400 midwives produced each year, fewer than 50 actually practice as midwives. In large measure this is because the hospitals that train them are not willing to hire them. It is evident that we need to revise our ideas about health care teams, breaking away from the hierarchical structure which makes the physician the captain of the team, the nurse a handmaiden, the social worker a shadow off in the fringe, and the paraprofessionals little more than menial workers. We need to avoid "dead end" jobs in the health professions and develop "career ladders" which will enable each individual to advance within a team relationship that makes appropriate use of many different types of knowledge and skills focused around common goals. There need to be more opportunities for joint training that focuses not simply on preparation for work in an agency or hospital but on preparation for understanding people and how they move about within their social milieu, how they can be helped to move into and through a system of services, and what role each member of the health care team should play in making services available.

This requires not only good initial training but also a continuous updating of training. In the United Kingdom, Dr. Jolly reported, Health Visitors are highly trained nurses who have done their State-registered nursing and midwifery before being trained as Health Visitors. The move now is for them to be "attached" to a family doctor for work in the community. In London, each Health Visitor in rotation is brought into the pediatric department where she spends one week in every aspect of departmental activity. This has three-way benefit: it enables the Health Visitors to feel once more that they are part of hospital life and involved in what goes on there; it gives the physicians much closer perspective on what is going on in the community; and it gives medical students a first hand opportunity to learn the role of the Health Visitor in the community so that they will know, when they become doctors, how to make use of community services and of the professional and technical knowhow of the nurses.

Training should encompass more than the medical aspect of various problems. We are too apt to assume that problems which lead to damaged development will come to the attention of physicians or other health personnel and that they will recognize them. Neither assumption is true. For example, studies have shown that the early behavioral effects of malnutrition are often present in children whom physicians see. But few physicians are trained to recognize such early warnings. We need to train them to be aware of more than just life or death matters. One aspect of this problem is the technical obsolescence of physicians in the middle years. Some way must be found to make physicians in practice aware of the many new insights into normal and abnormal development which have emerged since they completed their training.

The dearth of black physicians creates another critical manpower need, said other participants. Only two medical schools in the United States graduate a significant number of black physicians. More black physicians and more black nurses are needed, particularly in areas serving Negro communities, because the residents often resent or fear white doctors and nurses. However, this is usually not true if the medical team provides an outstanding quality of care. Indeed, members of minority groups sometimes resent the assignment of physicians and nurses of their own race because they think they are getting second best care.

It is a popular assumption, an obstetrician said, that we need more of each category of health personnel, but this is unrealistic. Before we plead for more manpower, more medical schools, more graduates in obstetrics and pediatrics, we ought to identify how effective we are in utilizing existing strengths. By reeducating and regrouping existing personnel we could enormously upgrade the quality of care.

Our present use of manpower is highly questionable, the participant continued. In many hospitals, members of the house staff--who are physicians-in-training and are therefore presumably less capable than the attending staff--perform twice as many procedures as the attending staff, although the attending staff is several times as numerous as the house staff. In surgical specialties the ratio is even more grotesque: a neurosurgical resident is apt to perform four or five or even 20 times the number of surgical procedures done by the established, fully-trained neurosurgeon who may limit his practice to a few cases per month. As the specialist's fees rise, his motivation to render service may decrease, thus more and more service may be required of house staff members who are too busy to do anything really well.

This is an example of poor distribution of manpower because the specialist lacks a sense of obligation to carry a full share of the service load. But poor distribution of manpower can occur for the opposite reason--a compulsive insistence of specialists on performing simple ritualistic services that can and should be rendered by less highly trained personnel.

The obstetrician is a case in point. He should spend less time on routine antepartum evaluations such as weight gain or loss and should be encouraged to spend more time in surveillance of patients in labor. He should stop spending his time monitoring the obvious and the inevitable and identify the areas where his professional judgment can make a difference in the outcome. It doesn't require obstetrical skill to take a patient's blood pressure or tell her she is getting too fat. This sort of documentation of certain features of the natural history of pregnancy can easily be handled by well-trained paramedical personnel. The majority of preventable perinatal damages occur during the course of labor and delivery, yet the obstetrician who spends his time on minutiae too often arrives only when the fetus is already emerging from the birth canal. This sort of participation is totally inadequate to assure the birth of a whole and healthy baby.

In the past, the obstetrical profession has been rather content with its own performance, the obstetrician continued. It assumed that the physical presence of a qualified physician ensured optimal intrapartum care. In fact, the quality of care provided was often not very different from that rendered by a midwife or a general practitioner because of limited knowledge about how to detect impending disorders such as fetal asphyxia. Even in some major institutions where high quality house staff is available 24 hours a day, the relative frequency of fetal asphyxia has not been altered during the past 10 years. Six percent of the patients are still delivered in a condition which is known, statistically, to lead to a threefold increase of neurological deficit. Theoretically, at least, asphyxiation in an infant is inexcusable; it is both diagnosable and preventable. We have the manpower and the facilities to deal with this problem. Our failure lies in not making physicians aware of their role in changing the outcome. We need to tell them what they can do and then require that adequate standards of care be maintained. This may involve, among other things, fetal blood sampling and continuous heart monitoring.

If we are to achieve our medical care goals, the obstetrician concluded, we must restructure obstetrical training and practice. This may take 30 to 40 years. We have recognized for a long time that the sharp division between the obstetrician who separates the fetus from the mother, and the physician who takes care of the newborn is not an optimal way of handling the problem. But what we are now realizing is that we need to involve the special skills of many other disciplines to guide the patient through the entire process of procreation in a way that will help her produce a whole, healthy human being. This concept must be incorporated into training. We need to restructure the medical schools to include departments of human reproduction or maternal and child health which draw on the participation not only of obstetricians and pediatricians but also on sociologists, psychologists, specialists in human development, nursing care, home care and other fields. Present methods of training are too costly, too time consuming, and leave too many gaps in services. We must break through traditional boundaries and design new types of training to meet new goals.

Better and more specific training of personnel for care of the newborn is an equally crucial need, said a neonatologist. In the past, the attitude toward newborn care has been much too casual. It has been relegated to the backseat in the hierarchy of medicine, with the prevailing attitude seeming to be that anyone can care for newborns since the bulk of them are normal, and as for the high risk babies, it is better to let them alone. If they are supposed to live, they will live. Unfortunately, this attitude is still prevalent in many places.

Yet experience in hospitals which offer concentrated neonatal care shows that the use of specialized personnel and modern equipment can have a tremendous impact on mortality and morbidity and, perhaps even more important, on intact survival. Over a period of seven years, infant mortality in one hospital has decreased 40 percent as a result of the vigorous attitude toward newborn care, the advent of the neonatologist, and the use of intensive care equipment. It is anticipated that results from a long-term followup study funded by the Children's Bureau will show an equally significant improvement in intact survival.

Efforts to analyze the relative value of the men and the machines in bringing about this reduction have shown that both are important, but the effect of trained personnel alone is more important than that of the machines. Unfortunately, good machines are an easier commodity to acquire than well-trained personnel. Therefore, one of the principal needs in efforts to improve the rate of intact survival is adequate training not only of neonatalogists but of nurses and paramedical personnel specifically attuned to the needs of the newborn.

The nurse is the key person in the nursery 24 hours a day. But except in a few major medical centers, training for the care of high risk newborns is badly lacking today in the United States at both undergraduate and graduate levels. After nurses are properly trained for newborn care, they not only are able to improve care in general but, in effect, to increase the reach of the physician. The same is true of other personnel--laboratory and xray technicians, audiologists, nutritionists and others.

Neonatology is a new specialty. Until a few years ago there were no formal training programs in neonatology. In this area of medicine as in many others, the specialty grew out of recognition of the need. Now there are neonatal fellowships in which trained pediatricians spend one to three years becoming attuned to the particular requirements of caring for normal and high risk infants. They may focus on clinical neonatology or basic research in the field or a combination of both.

What type of training can best further our goals of intact survival? What are the needs of the future, and how can they be met? First, the physician should have a minimum of one or two years of fellowship after his pediatric training. Part of this time should be spent in obstetrics and in the basic sciences so that he will be qualified not only as a neonatologist but as a perinatologist. His training can be either horizontal--that is, as a generalist with broad-based knowledge of all facets of newborn care--or vertical, with intensive training in some subspecialty of pediatrics such as neonatal cardiology. Both specialists and generalists are needed, but it is an impossible goal to train enough physicians in each specialty and still train enough generalists to oversee and correlate the total care of the newborn. Consequently our greatest emphasis needs to be on training generalists well grounded in clinical neonatology, research, obstetrics, and basic science. Individual interests in particular subspecialties can be provided secondarily and simultaneously.

One of the most difficult problems in training neonatologists and perinatologists, another participant said, is the lack of leaders who know enough about human reproduction to be able to teach the subject properly. This may be further compounded if all the top teaching and care talent is concentrated in a few institutions and medical schools. This is easily demonstrated in New York, where some of the best quality care and some of the worst quality care can be found within a single square mile area. Some way must be found to motivate well qualified physicians to make their skills and knowledge available to the peripheral institutions. If we are to bring about widespread reductions in infant mortality, better training, distribution, and use of health manpower are absolutely essential.

Assuring Intact Survival

Again and again the participants stressed that the goal of health care should go beyond the reduction of infant mortality to encompass the concept of intact survival as closely keyed in with the quality of perinatal care. We will get further faster if we can eliminate some misconceptions and concentrate on what sorts of intervention will be most productive. Some people express fear that decreasing infant mortality will result in survival of a higher percentage of handicapped children. Follow-up studies should be done so that this fear can be set at rest; there is no evidence that it is valid.

The important factor is what happens during the first minutes, the first half hour after birth. We don't have time to sit down and think about whether a baby is going to be alive or not, or whether it is going to be handicapped if it survives. We simply have to get to work immediately during those crucial minutes to assure that the baby has every possible chance for intact survival. Ideally, the obstetrician and the pediatrician should be in attendance the entire time, but this is not always possible. Many of the problems can be avoided by having highly capable nurses on duty who will be alert to any sign of trouble.

Some excellent programs of maternal and infant care and intensive neonatal care have been described during the conference, a participant said, but we need to be cautious about assuming that some particular type of care is automatically the best. In Sweden, where almost all babies are born in hospitals, the mortality rate is low. But it is almost equally low in rural areas of Holland where hospitalization for child birth is now customary.

It appears that all of the countries with favorable trends in the reduction of infant mortality have had government responsibility for planning and organizing comprehensive maternal and child health services for quite a long time. However, there are a number of good systems of obstetrical care, and we need to remain flexible if we are to meet the varied needs of different segments of our population. We cannot devise one form of care which will meet health care needs in all parts of the country. We may be able to learn a great deal from the experiences of other highly industrialized societies with large population concentrations. Systems that have worked well there are good models to study, because many of our principal problems are in the urban areas with high population densities.

We should not be talking solely in terms of medical care, the participants added, but in terms of integrating the total care services of the community. We have welfare services, health services, mental health services, educational services; but they seldom come together with any mutuality of objectives either at the Federal or State level. We need to stop fragmenting the elements of personal well-being and focus on what we can do to improve the environment in which the child is conceived and brought into the world.

Industry has a significant role to play in health services, said the director of clinical research of a major drug company. Industry, obviously, depends for its survival on economic viability; but this does not negate the value of the contributions it can make. Nursing homes are an example; these function on a business basis but provide a much needed service. Good business principles--efficiency, precise management, the ability to guarantee delivery of service--need to be applied in health care and hospital services, and are being applied in some areas.

The pharmaceutical industry has contributed to the reduction of infant mortality through its participation in development of medical equipment as well as medications. As greater understanding of basic biology evolves, there will be a surge of new tools for the reduction of neonatal mortality, particularly in relation to such problems as the RH factor and hemolytic disease. Contraceptives have come a long way but still have a long way to go, and the pharmaceutical industry is putting forth a great deal of effort on development of contraceptives that are safer, better, and easier to use. The role of prostaglandins in initiating labor that will lead to normal delivery with normal physiological performance is being explored, and may lead to better understanding of some of the factors affecting prematurity.

About $500 million per year is going into pharamaceutical research and development. When this amount of research is devoted to exploring and testing new concepts and delivering new entities for use in health care, it can have a great deal of impact. There needs to be a close liaison between industry and biologists and scientists working in new fields, and with those involved in the delivery of services.

In working toward intact survival, we need to think not only of specific techniques of care but also of the effects of the environment on premature babies, a psychologist said. A recent series of studies on incubators showed that they have an extremely high noise level. What happens to a child who lies in a noisy box staring up at a gray or white ceiling for a week, two weeks, a month, or even two or three months? And who has almost no chance to move except when he is fed or a medical student thumps the cage to see the status of his startle reflex?

Many premature units have large signs that say, "Restricted. Unauthorized Personnel Keep Out." The parents must have the feeling that this child of theirs is occupying a wing of an Atomic Energy Commission building. They must also have the feeling that he is a very sick, fragile baby, and this feeling is apt to spill over when they take him home from the hospital. They are apt to be afraid of him and continue his sterile environmental deprivation, handling him as if he would break the minute he is picked up. We should teach parents that these children need to be stimulated and played with and given access to the sounds and activities of the environment just as full-term babies are. Farmers pipe in music for their dairy cows. Why can't we program in the kinds of pleasant stimulation that prematures need if they are to develop normally, and teach parents to treat them like normal babies with a few special problems? This may be essential to healthy development.

There is another side to this coin, another participant suggested. It is also important to teach parents how to leave their babies. In one hospital, every mother in the obstetrical unit leaves the hospital and goes out to dinner with her husband. This is, after all, one time when they have really good baby sitters. This increases the husband's stature, so that he stops being left out of the picture. It also sets a positive tone for the first occasion when the mother has to leave her baby in someone else's care, and this attitude of freedom and confidence is apt to carry over into the attitude of the mother when she takes the child home.

All of these approaches are useful, but there is a lot we don't yet know about what constitutes intact survival. Do we use IQ levels? Motor development? Where do we draw the line between someone who will be a useful member of society and someone who will not?

There are even more basic questions still unanswered about why some children with particular types of insults such as anoxic damage develop normally while others turn out to be handicapped. Is this related to what they started with genetically, or is it due to other factors? Is the child from a poverty neighborhood whose father is unknown and whose mother has produced 10 children before she is 28 less able to survive such insults than a child from a healthier, less deprived background?

What are the real keys, the most important factors in assuring that the child who survives will be a whole and healthy individual?

In an effort to answer questions of this kind, and to assure that each infant has the best possible chance of intact survival, Georgetown Hospital in the District of Columbia set up a "high risk committee" which has met once a month for the past year. This committee includes 12 disciplines with representatives from obstetrics, pediatrics, nursing, public health nursing, anesthesiology, administration, the out-patient department, the laboratory, and so on. The committee listed 20 high risk classifications. These have been circulated to all obstetricians affiliated with the hospital. Before they send patients into the hospital, they fill out a simple form. If it appears that the mother will be a high risk patient, her chart is flagged and a whole set of activities goes into motion, depending on the kind of high risk problem she presents. She receives the special attention she needs; the baby is taken into the intensive care unit immediately after birth and is followed through the first year of life. Precautionary measures of this kind should become part of the routine of every hospital with responsibilities for obstetrical and infant care.

NEW INSIGHTS AND NEW DIRECTIONS

In closing the conference, Dr. Falkner commended the participants on the productive level of dialogue they had maintained. The discussion, he said, had highlighted many important points which have implications for further action. The result may not be an immediate reduction in infant mortality, but new insights and new directions will have an effect on the larger goal of providing services that will enhance the health and well-being of mothers and children.

Figure I

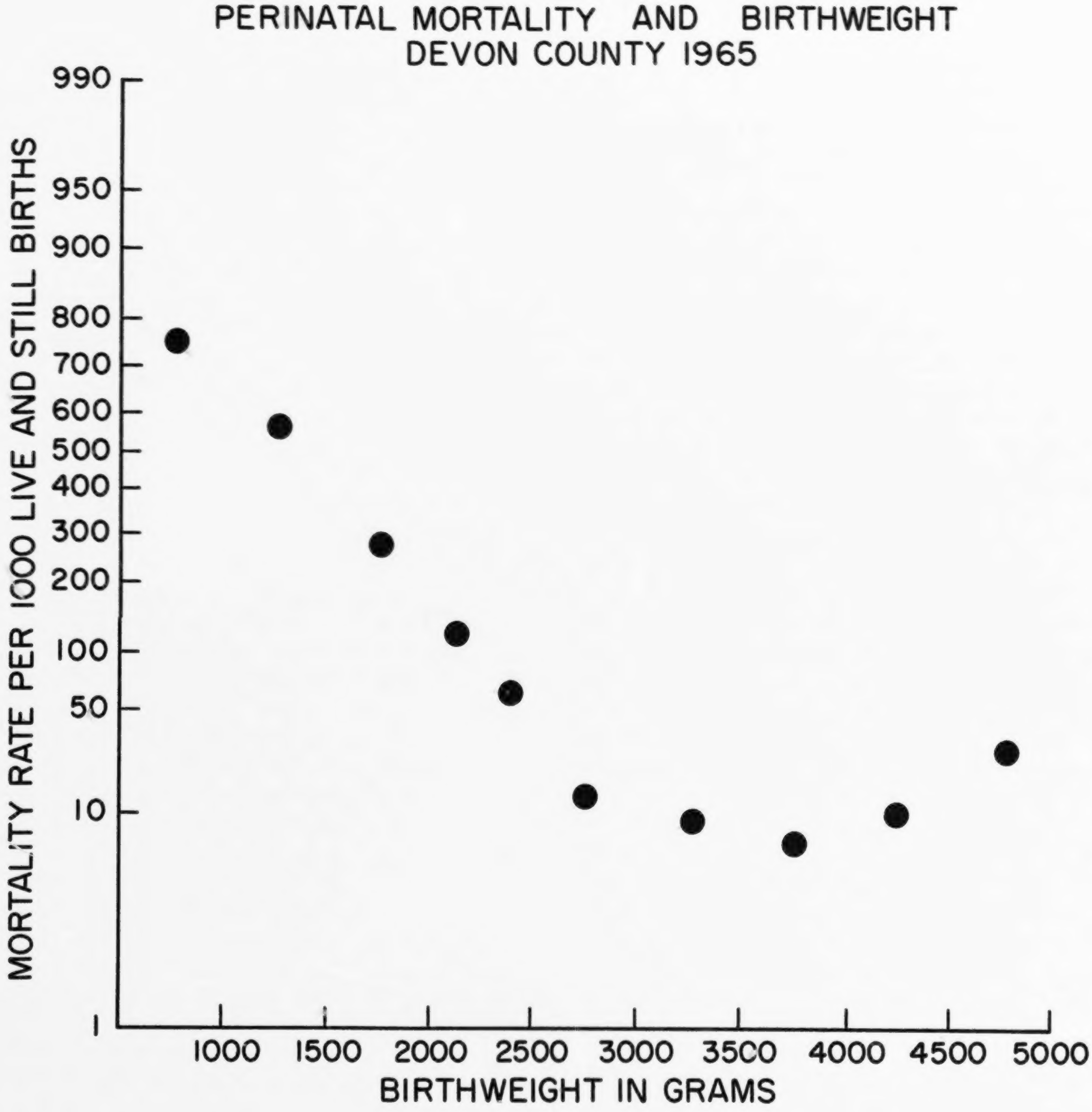

PERINATAL MORTALITY AND BIRTHWEIGHT
DEVON COUNTY 1965
MORTALITY RATE PER 1000 LIVE AND STILL BIRTHS
990
950
900
800
700
600
500
400
300
200
100
50
10
1
1000
1500
2000
2500
3000
3500
4000
4500
5000
BIRTHWEIGHT IN GRAMS

Table 1

PERINATAL MORTALITY IN TERMS OF BIRTH WEIGHT RATE PER 1000 LIVE AND STILL BIRTHS

Population	Birth Weight		
	2501 g	Over 2500 g	All
England and Wales, County Boroughs 1963-65	223	12.7	29.8
England and Wales, All Other Local Authorities 1963-65	235	11.9	26.9
England and Wales, Total 1963-65	230	12.2	28.0

Figure II

PERINATAL MORTALITY AND BIRTHWEIGHT
SINGLE LIVE AND STILL BIRTHS, U.K. MARCH 1958

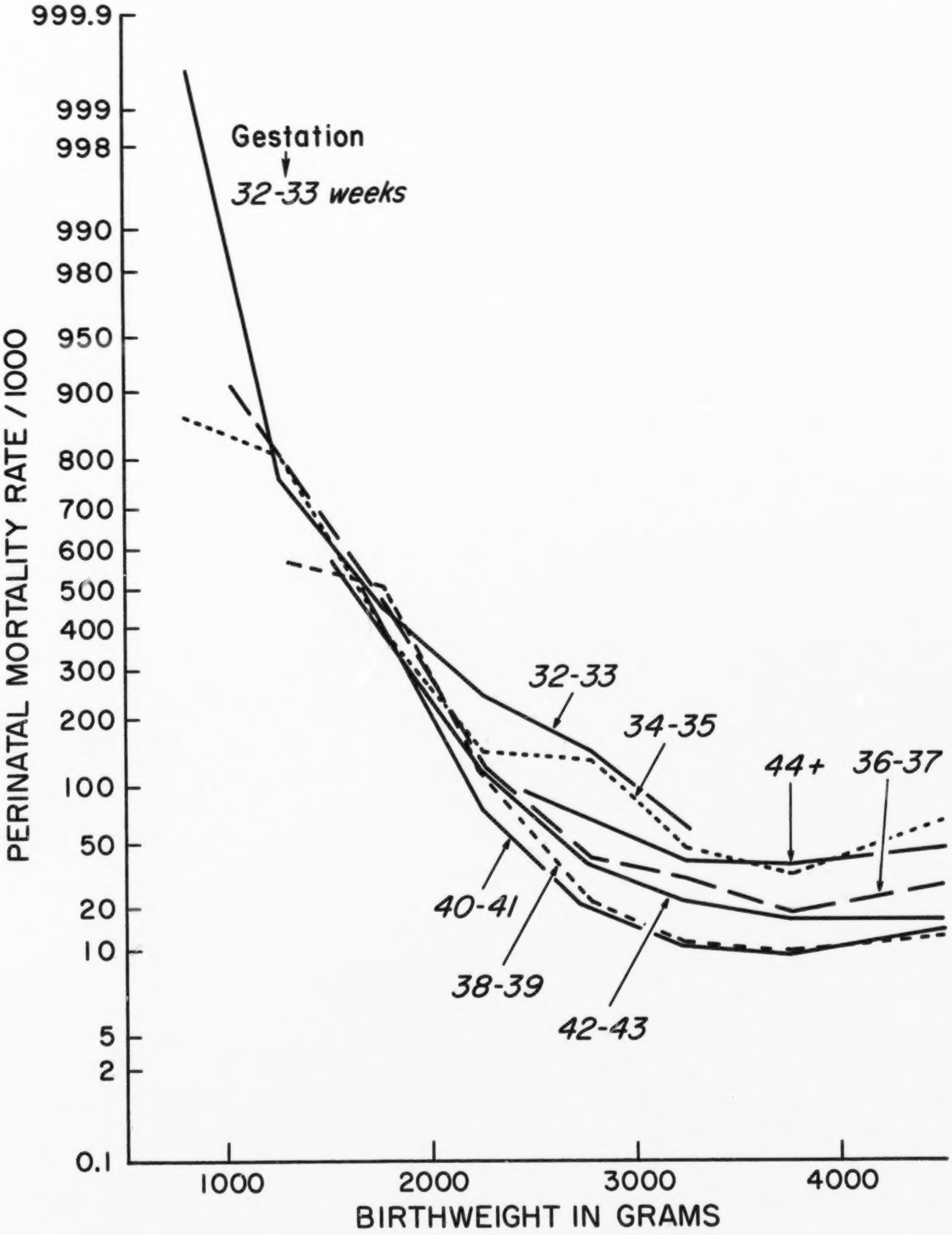


Figure III

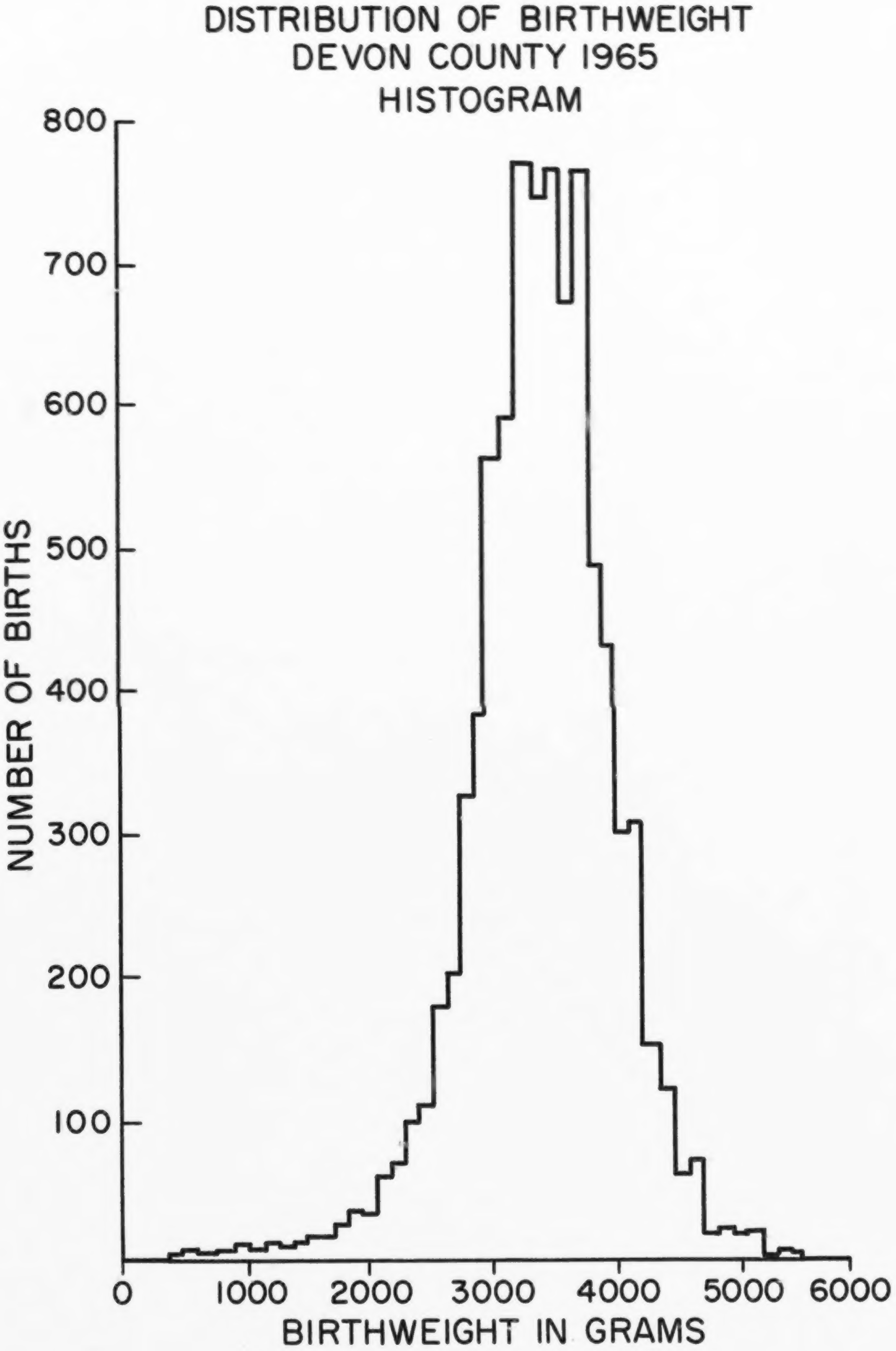
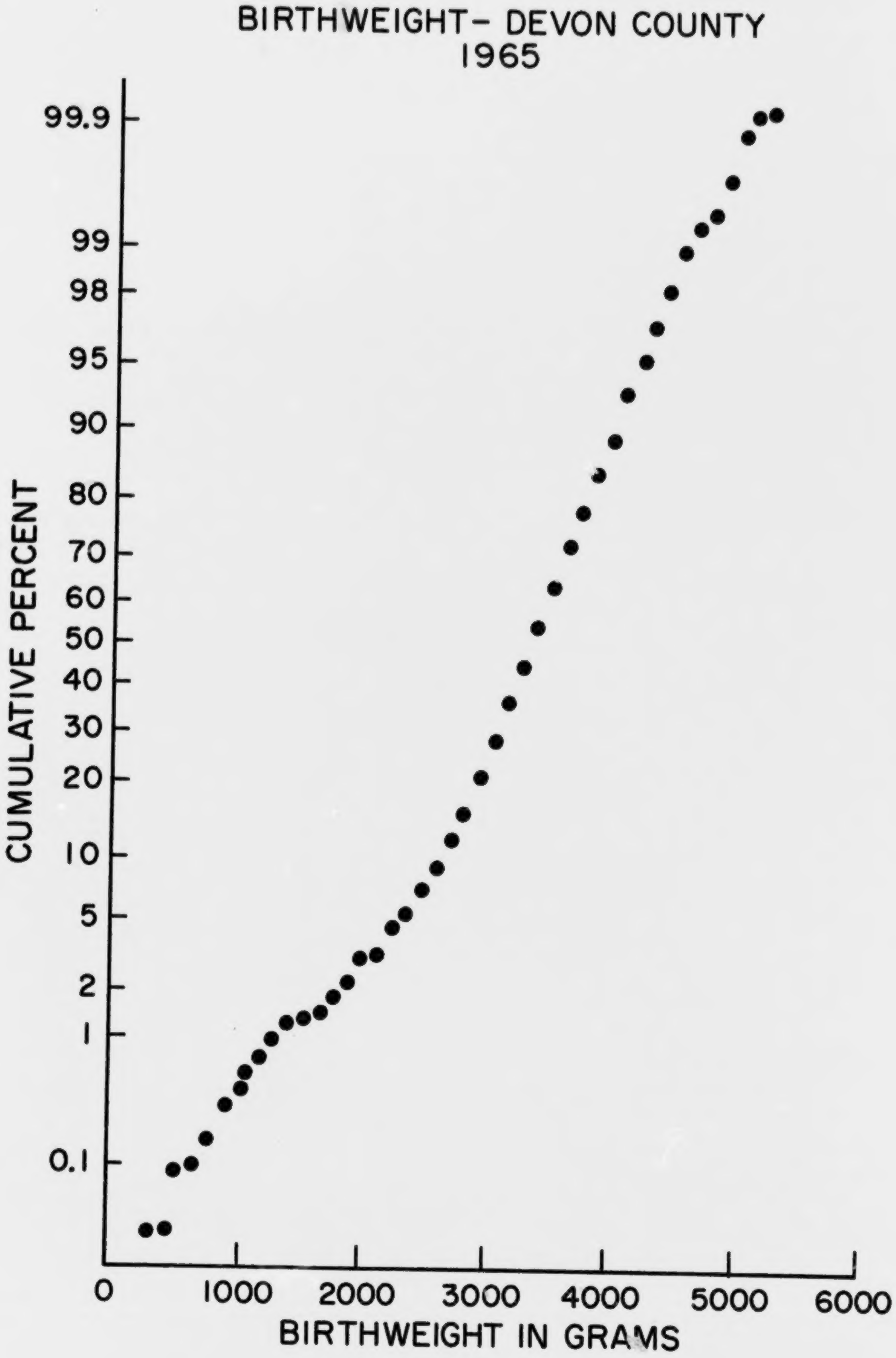

DISTRIBUTION OF BIRTHWEIGHT
DEVON COUNTY 1965
HISTOGRAM
NUMBER OF BIRTHS
800
700
600
500
400
300
200
100
0
1000
2000
3000
4000
5000
6000
BIRTHWEIGHT IN GRAMS

Figure IV


BIRTHWEIGHT- DEVON COUNTY
1965
CUMULATIVE PERCENT
99.9
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.1
0
1000
2000
3000
4000
5000
6000
BIRTHWEIGHT IN GRAMS

INDEX

A

Abortion
  family size limitation, and, 34
  fetal wastage, and, 34
  first child following repeated abortions, 34
  Hungary, in, 12
  infant mortality and, 7
  Japan, in, 34
  laws a complex question, 7
  physical consequences of, 7
  prematurity and, 7
  reasons for, 29
  right of child to be born, and the, 29
  Scandinavian countries, in, 46
  techniques discussed, 34
  when fetus is irreparably damaged, 46
Achimota School, Ghana, 23
Acid base, 48, 49
Acidosis, 50
Adamsons, Karlis, iii, 46, 48, 49
Adrenalin, 51
Adults have right to die, 30
Adverse circumstances, child born in, 41
Age at marriage, 31
Age gaps between children, 33
Age of mother, 3, 47
  factor, as a, 14
  infant mortality,and, 20, 32
American Medical Association, 41
Amidei, Nancy, iii, 39, 40, 41
Amniotic study, 49, 53
Analgesia, 51
Analgesia, too much? 48
Andrews, Billy F., iii, 49
Anemic mother, 49
Anesthesia, 51
Anoxic damage, 66
Ante-natal medical care, 13
Antibiotics, 51
Apathy, 45
Ashford, John R., iii, 9, 10, 11, 12, 13
Asia, death rate higher for girls in, 17
Asphyxia, 8, 51, 62
Atherosclerosis, 53
Atherosclerotic disease, 48

B

Babies, management problems in hospital, 55
Barton, Betty, vii
Beattie, Walter M., iii, 25, 27, 28
Behavioral effects of malnutrition, 61
Behavioral factors in the use of health services, 27
Berk, Anne, vii
Biometric issues, 9-16
Birth and death records matching, 33
Birth control in Ghana, 22
Birth, high-risk, predicting, 13
Birth injuries, 21
Birth, intensive care at, 5
Birth intervals, 31
Birth rate, Swedish, 20
Birth statistics, U. S., 33
Birth weight
  data, Gaussian form of, 11
  economic status of mother, and, 35
  females weighed less than males, 13
  gestational age a combined factor in infant mortality, and, 13-14
  low, 44
    abortion and, 7
    high death rate, 14

B (con'd)

Birth weight (con'd)
  low (con'd)
    increase in, 3
    infant mortality relationship, 9
    influence in infant mortality, an 9
    Maternity Care Program and, 38
    mental retardation, 35
    regression in Hungarian statistics, 12
Black militant groups' priorities, 44
Black physicians, dearth of, 61
Blindness in babies, 52
Blood, monitoring of fetal, 47
Blood sampling, fetal, 62
Blood transfusion and legalities, 30
Brain damage and low birth weight, 35
Brain damage in premature infants, 52
Brain damage prevention, 5
Breast feeding, 3
  Ghana, in, 24
  sensory input, and, 3
Brimblecombe, Frederic S. W., 9
Boston College Law School, 28
Business principles need to be applied to health care, 65

C

Campbell, Arthur, iv, 30, 33
Calcagno, Philip L., iii
California study on public hospital practices, 36
Cardiorespiratory problems of newborn, 50
Cardiovascular performance of fetus, 47
Care, inadequate, 46
Care of infants in Yale-New Haven Hospital experiment, 55
Care services, integrating the, 65
Case finding, 41
Ceasarian section, 50
Charing Cross Hospitals, London, 22
Child abuse, 7
Child health and family planning, 31
Child health services expansion, 5
Child murder, 7
Child welfare in Sweden, 21-22
Childbearing complications and mental retardation, 36

C (con'd)

Childbearing, frequency of, 33
Children, age gaps between, 33
Children, the legal rights of, 29-30
Children, unwanted, statistics on, 31,32
Children's Bureau Maternity and Infant Care Projects, The, 15, 25, 43
Children's Bureau of the Department of Health, Education and Welfare, 35
Chloromycetin, 52
Chromosomal aberrations, 2
Chromosomal defects, 48
Columbia Presbyterian Medical Center, 15
Columbia University, 46
Community Action Programs, 40
Community health needs, 6
Community health programs, needs, conference on, 40
Community health programs and the pediatrician, 52
Community participation in health programs--comments on, 40
Conditions that ensure children are wellborn, 42
Conference--points underscored during, 2
Congenital anomalies, 2
Connecticut Department of Health, 54
Consumer control of health services, 43, 44
Consumer to be treated with dignity, 44
Consumers--patients thought of as, 44
Continuity of health care, 27
Contraceptive pills and decline in fertility, 31
Contraceptives, 65
  chemical, infant mortality and, 7
Corfman, Philip, iv
Crib deaths, 8
"Critical incidents," 4
Critical minutes, the, 64
Cultural variability and health care, 26

C (con'd)

Cyanosis, 51
Cytogenetic studies, 46

D

Data on birthweight-infant mortality relationship, 10
Death
  can be eliminated, 39
  causes of, analyzing, 21
  infant
    see Infant mortality
Deep South, infant mortality in, 1
Delivery, normal, 65
Dental care, 50
Depression of 1930's, a factor in infant mortality? 19
Design of infant care facilities at Yale-New Haven Hospital, 55
Developing nations and infant mortality, 16
Developmental problems, 17
DHEW, 5
Diabetes, maternal, 14
Diabetic mother, 48
Diagnosis and treatment, 49-51
Digitalis, 51
Disadvantaged, the, 3
Diuretics, 51
Doctor-patient relationships, 43
"Don't just stand there," 52

E

Economic background and low birthweight infants, 35
Economics of maternity care in Sweden, 21
Ectopic pregnancy and method of abortion, 34
Education and unwanted children, 31-32
Electrocution of patients, 54
Embryo, physiology and biochemistry of, 50
Emergency Maternity and Infant Care Program, 39
Emotional upset in mother, 48
Environment
  economic and social, 4

Environment (con'd)
  infant mortality, and, 2
  low birthweight and, 3
  prematurity, and, 66
Environmental design and health services, 26-27
Environmental factors and birthweight, 12
Environmental hazards and health care, 26
Enzyme deficiencies, 46
Enzyme systems inhibition, 50
Enzymatic screening tests, perinatal, 53
Epidemiological issues in infant mortality, 9-16
Epidemiological studies, 8
Equipment, modern--its impact on infant mortality, 63
Ethnic factors, 14
Ethnic groups, infant mortality rate differences in, 42
Etiology of problems of pregnancy, 50
Evaluation of fetal maturity made too late in pregnancy, 47
Exeter, England, University of, 9
Exeter studies, the, 9-10
Extra time in utero, 50, 51

F

Falkner, Frank, i, iii, iv, 67
Family groups fragmentation in the U.S., 26
Family planning, 16, 37, 43
  conclusions on value of, 33
  Ghana, in 23
  infant mortality, and, 6-7, 30-34
  neonatal death rate and the, 32
  pregnancy inadvisable, and, 32
  Sweden, in, 20
  unwanted children, and, 31, 32
Family size in U.S., 31
Federal intervention in health service provision, 40
Federal-State system and a national health service for the U.S., 41
Feeding premature infants, 51-52
Fertility rates in the U.S., 31
Fetal circumstances, assessment during gestation, 46

F (con'd)

Fetal damage and abortion, 46
Fetal death, late, 10
Fetal excellence, 46
Fetal immunological problems, 14
Fetal response to labor, 47
Fetal wastage following abortion, 34
Fetus,
  biochemical development of the, 53
  care of, 5
  legal rights of the, 25, 28-30
  viability concept of the, 28
  wrongful death of, 29
Fibroplasia, retrolental, 51
Fielding, Jonathan, iv
First child following repeated abortions, 34
First day of life crisis period, 12
First week of life, infant death and the, 2, 3
Forceps extraction to be avoided, 50
Free services lower infant mortality rates, 16
Freedman, Lillian, iv, 18
Frustration in mother, 48

G

Gaussian distribution of birthweight data, 11
Georgetown Hospital, Washington, D.C., 67
Gershenson, Charles P., iv, 43
Gestation, factors determining duration of, 8
Gestation, too short--key influence in infant mortality, 9
Gestational age, information on, difficult to obtain, 9
Ghana
  birth control in, 22
  breast feeding in, 24
  Ghana Medical School, 23
  infant mortality rate in, 16, 22-25
  people of, the, 22
  Russian-trained physicians in, 25

Ghana (con'd)
  stoicism of mothers in, 23
Ghetto-living and the use of health services, 27
Ghetto, socioeconomic fabric must be changed in, 43
Gluck, Louis, iv, 51, 53, 56
Gonorrhea of the eyes, prophylaxis, 51
Goteborg, birth arrangements in, 20
Goteborg University Pediatric Clinic, 19
Government intervention and infant mortality, 18
Greenhouse, Samuel, v
Growth, economic and population, 31

H

Handicapped children in Sweden, 22
Handling and the newborn, 58
Handling newborn experiment, 58
Hasselmeyer, Eileen G., v, 56, 57, 58
Health care
  business principles and, 65
  factors in infant mortality, 46-67
  frustrations in obtaining it, 48
  new and more efficient care needed, 60
  planning and consumer participation, 6
  services and low birthweight, 3
  services transition, in a state of, 6
  Sweden, in, 21-22
  "tasks being performed by wrong people," 60
Health centers, transportation required to, 50
Health education in Ghana, 24
Health manpower, 60-64
  how are we using it? 61
Heart monitoring, fetal, 62
Health personnel, new categories of needed, 41
Health programs, comments on community participation, 40
Health Services and Mental Health Administration, 5
Health services,
  consumers take part in development of, 43

H (con'd)

- Health services (con'd)
  - improvement for reduction in infant mortality, 34-39
  - public pressure for, 40
  - realistic view of, a, 26
  - reasons they are not used, 45
  - the demand for, 40
- Health visitors in United Kingdom, 60
- Hemophilia, 46
- High risk
  - babies, attitude toward, 63
  - classifications, 20, 67
  - "High Risk Committee" of specialists from 12 disciplines, 67
  - mothers at Georgetown Hospital, Washington, D.C., 67
  - populations, 47
  - women, comprehensive care provided for, 35
- Hildick-Smith, Gavin, v
- Holland, hospitalization for childbirth in, 65
- Home conditions, 4
- Hong Kong, low infant mortality rate in, 17
- Hospital delivery in Sweden, 21
- Hospital house staffs, procedures performed by, 61
- Hospitals, pressure to build more, 42
- Howard, Geraldine, 23
- Human contact encouraged, 55
- Human needs, Senate Select Committee on, 39
- Hungarian data, 12
- Hunter, Jehu, v
- Hyaline membrane disease, 8, 47, 50
- Hydrops fetalis, 50
- Hyperbilirubinemia, 50
- Hypertensive cardiovascular disease in mother, 47
- Hypertensive disease, 38
- Hypocalcemia, 50

I

- IBM cards in recording infants' data, 56
- Illegitimacy, 4
- Illegitimacy and low birthweight, observations on, 35
- Immigration and health care, 26
- Implantation and damaged uterine living, 34
- Income and ethnic differences, 14
- Incubators
  - early design of, 57-58
  - high noise level of, 66
  - what happens to babies in? 66
- Infant care fragmented, 54
- Infant mortality
  - Baltimore, in, 35
  - birthweight and, 9
  - birthweight distribution, and, 12
  - borderline statistical cases, 20-21
  - breast feeding and, 3
  - British data on, 9
  - chemical contraceptives and, 7
  - chromosomal aberrations, in 2
  - conference on, 1
  - comparisons, international, 17, 19
  - congenital anomalies in, 2
  - consumer control affecting, 44
  - "critical incidents," and, 4
  - cultural pattern in Ghana and the, 22-23
  - complex problem, a, 8
  - concentration of resources of U.S., 41
  - data on, 7
  - decrease in United States, 18
  - decrease in birth intervals, and, 17
  - differences between States and social groups, 38
  - differentials in the U.S., 26
  - disadvantaged, and the, 3
  - distasteful topic, a, 1
  - environment of child and, 2
  - factors most important in, 43
  - family planning advantages and, 32
  - family planning and, 6-7, 30-34
  - first week of life, after, 2
  - first week of life, during, 2, 3
  - free services lower the rate, 16
  - gestational age and, 9
  - Ghana, in, 16, 22-25
  - health care factors in, 46-67
  - Hungary, in, 12
  - immediate reduction of rate possible, 5

I (con'd)

Infant mortality (con'd)
  immigration to Britain, and, 12
  increased parity and, 17
  India, in, 17
  influences affecting, wide variety of, 9
  international spectrum of, 16-17
  intervention to prevent, 4-5
  issues and potential solutions in, 2
  Japan, in, 34
  key issues in, 1-9
  learning from experiences of other countries, 7-8
  legal rights of the fetus, and, 28
  low in U.S. Oriental population, 26
  low rate achieved, 2-3
  male-female ratio, 17
  measure of social policy, a, 25-28
  measure of the adequacy of social policy, a, 28
  Medicaid and, 6
  medical care quality, and, 2
  migration and, 35
  minimum point of, 2
  mobility and, 27
  national experiences, 16-25
  need to attack many problems of, 14
  Negroes and, 4
  New York City rates in 1966, 38
  "nothing normal about," 1
  pregnancy intervals, and, 37
  preventable problems and, 2
  prevention of, a desirable social goal, 29
  problem increases as society becomes complicated, 42
  race and, 4
  rate comparisons, U.S. and Sweden, 2
  rate decreased by more medical centers, 42
  rate of, shameful, 2
  records, their value in research, 33

Infant Mortality (con'd)
  reduced through maternity and infant care, 34-39
  reductions in, 17
  reduction of by families, 3
  reduction of differences in population groups, 38
  reduction of--should it be a goal? 41
  research, areas of, i
  responsibilities of members of health care team, 6
  slowdown in 1950--1960 period, 19
  social effectiveness, and, 8
  socioeconomic factors in, 25-46
  standard of living, and, 21
  statistics, 1
  statistics, U.S., 3
  suggestions for tackling problem, 13
  Sweden, in, 19-22
  Swedish rate is low, 16
  underlying problems, the, 9
  United States, in the, 17-19
  United States rate needs improvement, 16
  unmet training needs, 6
  West Africa, in, 44
  white and nonwhite differentials, 26
Infants cared for under maternity care project, 37
Infants mixed in hospital, 54-55
India
  birth and death recording in, 16
  child mortality in, 17
Indigency, medical, 27
Infections, 17, 50
  control in nurseries, 54
  resistance to, 3-4
  spread of, 54
  surveillance program, 56
Infectious diseases and health care, 26
Inheritance rights of fetus? 29
Initiation of labor, role of fetus in, 8
Institutional change necessary, 42
Intact survival
  see Survival
Intelligence Quotient count, 42, 66

I (con'd)

Intensified care in Sweden, 22
Intensive-care units, 56
International Planned Parenthood Federation, 23
International spectrum of infant mortality, 16-17
Intervention, prenatal, 5
  prevent infant death, to, 4-5
  priorities establishment in, 5
In utero sickness, 5
Investigative role of medical students, 41
Isolation of newborns, 54
Israel, immigrants absorbed into, 43

J

Japan
  abortion rate in, 34
  infant mortality rate in, 34
Jehovah's Witnesses and blood transfusion, 29-30
Jolly, Hugh, v, 22, 44

K

Karlberg, Petter, v, 19, 20, 21
Katz, Sanford N., v, 28, 29, 30
"Keeping babies alive not enough," 46
Key issues in infant mortality, 1-9
Knutti, Sarah H., vi

L

Labor
  factors responsible for onset of, 3
  fetal response, and, 47
  initiation of, 8
    prostaglandins and, 65
Laboratory methodology, 49
LaVeck, Gerald, 1
"Legal personality" of fetus, 29
Legal rights of children, 29-30
Legal rights of the fetus, 25, 28-30
Legislative changes and improvement in infant mortality rate, 18
Lesser, Arthur J., vi, 18, 35, 39
Life, definition of, lacking, 28
Limitation of family size, effects of, 31
London's health visitors, 60
  training of, the, 60
Louisiana Purchase Exposition 1904--premature baby care at, 57
Low birthweight
  see Birthweight
Low income groups and health care services, 39
"Low score" babies surviving with handicaps, 48
Lowe, Charles U., vi, 1
Lundeen, Evelyn, 57

M

Machines used with infants, 53-54
Malformation, congenital, 21
Malnutrition, 17
  behavioral effects of, 61
Manpower, health, 60-64
  better use of, 6
  poor distribution of, 61
  prejudice against midwives, 60
  proper use of, 46
  two schools of thought on, 60
Maternal health and family planning, 32
Maternal nutrition, 3
Maternity and Infant Care Project, New York City, 32
Maternity and Infant Care Program, 5, 35, 36, 39, 42, 49, 52
Maternity care, inaccessibility of, 36
Maternity care project, fiscal needs for, 37
Maternity care project, local differences, 37
Maternity care regulations, detrimental effect of, 36
Maternity services--need for change exemplified, 36
Matheny, Adam P., Jr., vi
Medicaid, 6
Medical care
  ante-natal, 13
  attitudes toward, 14
  community participation and, 40
  differences in pattern of, 12

M (con'd)

Medical care (con'd)
  economics of, Swedish, 21
  New Haven project, the, 43
  quality of, 2
Medical practices, critized, 51, 52
Medical practices, inadequate, 56
Medical schools and regional health care, 53
Medical services should be a national priority? 28
Medical student's problem, 43
Medical teaching in Ghana, 24, 25
Medicine, preventive, 42
Medicine--"we're doing a terrible job" in U.S., 51
Mental retardation, 35, 36, 42
Mentally ill in Nigeria, 44-45
Metabolic defects, 48
Metabolism differs between babies, 52
Michael Reese Hospital, Chicago, Illinois, 57
Micro and ultramicro techniques, 49
Midwives prejudice against, 60
Migration and infant mortality rates, 35
Mobility and use of health services, 27
Morbidity and mortality, family planning and, 30
Morbidity, reduction of, 4
Moriyama, Iwao, vi
Motivation and the use of health services, 45
Motor development, 66
Multiparity and high risk, 49
Muscular dystrophy, 46

N

National Center for Health Statistics, 19
National experiences with infant mortality, 16-25
National health program for the U.S., difficulties in providing, 41
National health services programs in other countries, 41
National Medical Association, 41
National Perinatal Foundation--the need for, 52
National priority--should medical services be a? 28
Negro girls, pregnant, care of, 38
Negroes and infant death, 4
Neighborhood health centers, 36
Neonatal care centers, more needed, 5
Neonatal death rate and family planning, 32
Neonatal excellence, 46
Neonatal research and care, 51-56
Neonatology a new specialty, 63
Neurological deficit, 62
New Haven project, consumers' part in, 43
Newborn
  handling needs of the, 58
  hematologic disorders of, 50
  nursing care of, the, 56-60
  unit an isolation ward, 54
NICHD, 1
NICHD's Center for Population Research, 31
Nigeria, harnessing native and Western medicine in, 44
Nurse, the key person, 63
Nurse, the obstetrical and the pediatric, 59
Nurses, London's health visitors, 60
Nursing
  administration, 59
  care of newborn, 56-60
  premature--early practices, 57
  procedures, the effects of, 59
  recruitment, 59
  techniques have changed, 57
  too traditional, 57
nutrition, maternal, 3, 4, 43, 49
Nutrition, Senate Select Committee on, 39

O

Obstetrical training, restructuring, 62
Obstetrician, comments on his work, 62
Obstetricians and community health needs, 6
Obstetrician's obligation, 49

O (con'd)

Obstetrics, fetal excellence the new goal of, 46-49
Office of Economic Opportunity, 40
Optimal services for people of mixed socioeconomic levels, 39
Oral contraceptives discontinuation and pregnancy study, 34
Organ transplants and life definition, [illegible]
Organogenesis, [illegible]
Oriental population of U.S., low infant mortality rate of, 26
Other countries, learning from, 7-8
Oxygen in incubators, 52

P

Paramedical personnel, 50, 63
Paraprofessionals, 41, 60
Parents leaving babies, 66
Patient-doctor relationship, 43
Patients, electrocution of, 54
Pearson, Paul H., vi
Pediatric care, 16
Pediatric progress in Ghana, 22-25
Pediatric training for London's health visitors, 60
Pediatrician, excellence of, 48
Pediatrician-obstetrician dialogue, 48
Pediatrician should be in labor and delivery rooms, 50
Pediatricians and community health needs, 6
Pennsylvania Hospital study, 37
People suited and unsuited for procreation, 47
Perinatal conferences, 56
Perinatal damage and the obstetrician, 62
Perinatal, differing definitions of, 15
Perinatal mortality, 44
  birth weight, and, 9
  data, 7
  determination of, 11
  gestational age, and, 9
  rural areas, in, 11
  urban areas, in, 11
Perinatal nursing, 59
Perinatal research, 53
  needed, 52
Perinatal study, British, 10
Perinatologists, 63, 64
Personnel
  see also Manpower, health
  paramedical, 63
  recruiting and training problems, 57
Pharmaceutical research, 65
Pharmacology, neonatal, 49
Phelps, Karen, vii
Physical and mental deficit following survival, 8
Physicians
  dearth of black, 61
  not enough to go around, 45
  technical obsolescence of, 61
Physiology, neonatal, 49
Pitfalls of statistical grouping, 15-16
Placenta previa, management of, 50
Placental dysfunction, 51
Placental physiology, 53
Planning an infant care unit, 56
Play activity of children in Ghana, 24
Poor people and low birth weight, 36
Poor People's Campaign, 40
Population and economic growth, 31
Population growth and health levels, 31
Population research, 31
Postmaturity, 51
Postmaturity and birthweight, 9
Postpartum visits in health care, 37
Poverty, 4
  childbearing, and, 37
  health services, and the use of, 27
  infant mortality, and, 1, 42
  poverty-level women, programs designed for, 37
Preeclampsia, 48
Pregnancy interval data, 32
Pregnancy intervals, 3
Pregnancy intervals and infant mortality relationships, 37
Pregnancy
  problems of, 50
  too frequent, 4
  wastage, 38

P (con'd)

Premature babies, stimulation of, 66
Premature infants' feeding, 51
Prematurity, 44, 49, 65
  abortion and, 7
  death rate improvement in Ghana, 24
  increase in, 3
  Sweden, in, 20
Prenatal and postnatal diagnosis and treatment, 49-51
Prenatal care, effects of, 38
Prenatal care, social conditioning to, 15
Prenatal intervention, 5
  see also Intervention
Prenatal medical treatment of fetus, 29
President's Panel on Mental Retardation, 35, 36
Priorities in observation and research need to be set, 48
Priorities in relation to intervention, 5
Preventable problems and infant mortality, 2
Preventive care before pregnancy, 4
Preventive medicine, 16, 42
Procreation, people suited and unsuited for, 47
Procreative processes, deemphasis of, 47
Program planning and poor people, 40
Prostaglandins in labor initiation, 65
Psychiatry, Nigerian, 45
Psychologists, 62
Psychosocial family relationships, 26
Psychosocial motivational characteristics and health services, 27
Public health nurses, 52
Public policy
  development of, 1, 2
  health services, and, 28
Public pressure for health services, 40
Puerto Rican girls, pregnant, care of, 38

R

Racial differences in medical care, 51
Rate, infant mortality in U.S., 2
Records, their value in infant mortality research, 33
Religious convictions and blood transfusions, 29-30
Research
  areas in need of, i, 2
  need for, the, 1, 8
  needs, the greatest, 8
  suggestions for, 1
Resources, lack of, 3
Respiratory disorders, 21
Respiratory distress, 51
Responsibilities of members of health care team, 6
Rh antibodies, effects of, 8
Rh factor, the, 65
Rh factor and transfusion legalities, 30
Rh sensitizations, 49, 50
Rocking chairs, 55-56
Rosa, Franz, vi, 16, 18

S

Sanitation, 4
Scandinavian countries, reason for abortion in, 46
Seligman, Jerry, vii
Senate Select Committee on Nutrition and Human Needs, 39
"Service providers"--a mix of needed, 41
Services, acceptance of limited by educational background, 45
Services, developing a new mixture of, 39-41
Services for "poor people" tend to be poor services, 39
Sex differentiation in Asian death rate, 17
Sex differentiation in birthweights, 13
Shultz, Carl S., vii
Sickness in utero, 5
Skepticism about effects of prenatal care, 38
Smith, Donald C., vii
Social class, infant mortality and, 3-4

S (con'd)

Social effectiveness and infant mortality, 8
Social environment
  see Environment
Social functioning and infant mortality, 28
Social medicine in Ghana, 24
Social policy and infant mortality, 25-28
Social policy issues, 25
Social Security Act, 1967
  Amendments to, 36
Social work education, 25-26
Social work, professional, new directions of, 25
"Socialized medicine," 45
Socioeconomic advances, the hope for real improvement, 42
Socioeconomic factors, 14
  family planning, and, 31
  infant mortality, in, 25-46
Sociologists, 62
South Carolina conference on community needs, 40
Spacing of births not an isolated variable in infant mortality research, 33
Specialist's motivation, 61
Standard of living and infant mortality, 21
Statistical grouping has pitfalls, 15-16
Statistics manifestly implausible, 16
Statistics on infant mortality, 1
Steroids in maternal urine, 51
Stillbirths and live births, 12
Stillbirths decrease in Sweden, 20
Stimulation of premature babies, 66
Structural organ maturity, 50
Student American Medical Association, 41
Student Health Organization, 41
Study on the handling of newborn, 58
Survival
  assuring intact, 64-67
  handicapping conditions, with, 4, 48
Survival (con'd)
  infants, of, 8-9
  intact--the goal, 51
  physical and mental deficit following, 8
  principal concern, a, 44
  what are the factors assuring healthy survival? 67
Surviving children, assuring health of, 2
Survivorship, 8-9
Sweden, infant mortality rate in, 2, 19-22
Sweden, low mortality rate in, 64
Swedish immigration to U.S., 20
Syracuse University School of Social Work, 25

T

Television used for health education in Ghana, 24
Temperature control of newborn, 49
Tetanus, neonatal, 17
Time and space and the use of health services, 27-28
Toxemia, 50
Training
  members of health teams, 6
  need for greatest emphasis on, 64
  new types of needed, 62, 63
Transportation to health centers required, 50

U

United Kingdom's health visitors, 60
United States infant mortality, 2, 17-19
United States' problem populations and infant death reduction, 6
University of California School of Medicine, 51
University of Ghana, 23
University of Louisville School of Medicine, 49
Unmarried mothers and stillbirths in Sweden, 20
Unwanted children, statistics on, 31, 32
Urban maternity care problems, 36
Urbanization and health care, 26

U (con'd)

Use statistics, health care in Sweden, 22
Uterus, damaged in abortion, 34

V

Ventilation, 49
Viability concept, the, 28
Viral disease in mother, 49

W

Well-being and breast feeding, 3
Wells, Leora Wood, i, vii
West Africa, infant mortality in, 44
Western medicine's acceptance in Ghana, 24
White and Negro mortality rates differences, 19, 26
Whites and nonwhites infant mortality differentials, 26
Witch doctor-psychiatric care in Nigeria, 45
Witch doctor's usefulness, 44, 45
Women from poverty backgrounds emigrating, 43
Women, need to improve health of young, 4
World Health Organization, 16
World Health Organization's definition of live birth, 20

X

X-ray with three-fold magnification, 55

Y

Yale-New Haven Hospital, 58
Yale-New Haven Hospital, experiments at, 54-55
Yale University School of Nursing, 57